

THE ARIZONA STATEWIDE WATERSHED FRAMEWORK

DRAFT

Water Quality Division

Arizona Department of Environmental Quality

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LIST OF ACRONYMS

ADEQ	Arizona Department of Environmental Quality
APP	Aquifer Protection Program
AZURITE	Arizona Unified Repository for Informational Tracking of the Environment
COG	Councils of Government
CWA	Clean Water Act
DOI	Department of Interior
DWR	(Arizona) Department of Water Resources
EPA	Environmental Protection Agency
ESA	Endangered Species Act
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRCC	Natural Resources Conservation Committee (state)
PPG	Performance Partnership Grant
PWSS	Public Water System Supervision
SRF	State Revolving Fund
TMDL	Total Maximum Daily Load
USACE	United States Army Corp of Engineers
USGS	United States Geological Survey
WLA	Waste Load Allocation
WPP	Wellhead Protection Program
WQD	Water Quality Division (of ADEQ)

Arizona Statewide Watershed Approach Framework Document

Glossary

environmental indicators: Measurements of environmental conditions or trends on environmental quality which can be used to evaluate resource protection programs and assess the general state of the environment. Environmental indicators must be sensitive to or linked to changes in watershed processes or stressors.

ground water: All water beneath the land surface. Ground water may occur in saturated or unsaturated zones, as isolated pockets, as moisture held in pores between grains of mineral soil, or as rivers of water flowing beneath the surface.

nested: The hierarchy of geographic management units where each smaller unit is a subset of all other larger units. For example, a project site is located within a stream reach, the stream reach is a subset of a watershed, the watershed is a subset of a larger river basin.

nonpoint source: A diffuse form of water pollution from various anthropogenic activities (e.g., agricultural field erosion, animal wastes, atmospheric pollution, street and urban debris) that accumulates in the watershed and is most often transported to the waterbody via runoff from rainfall.

point source: Wastewater discharged directly to the waterbody via a pipe that contributes to the overall pollution load to a waterbody.

source water: Either surface or ground water that is designated as a supply of drinking water for any number of people -- source water can also include the surrounding geographic area that serves as the watershed for the designated water supply.

stakeholder(s): Within the Arizona watershed approach, all individuals, organizations, and agencies that are involved in or affected by water resource management decisions for a watershed management zone.

surface water: All water that flows or is resting upon the land surface (e.g., lakes, streams, wetlands).

water quality standards (WQS): Provisions of state or federal law which consist of a designated use or uses for the waters of the United States, water quality criteria for such waters based upon such uses. Water quality standards are to protect public health or welfare, enhance the quality of the water and serve the purposes of the Clean Water Act.

watershed: Broadly defined as the geographic delineation of an entire waterbody system and the land that it drains above a specific outlet point. A watershed may also include ground water aquifers that discharge to and receive recharge from surface waters.

Glossary (continued)

watershed ecology: refers to all the elements and processes that interact within the hydrological unit that influence or affect all aspects of water quality (i.e., chemical, physical, and biological).

watershed management zone: The base planning unit for the Arizona watershed approach. Ten watershed management zones have been delineated and are generally based on hydrological basins within Arizona. Each watershed management zone will have at least one watershed advisory committee and a corresponding ADEQ watershed support team to complete the steps of the watershed planning and implementation cycle.

SECTION 1

INTRODUCTION

A river valley, including all the surrounding hills and mountains that slope toward and drain to the river, constitutes a single watershed. Hydrologists sometimes use the term *catchment*, illustrating the way a single watershed catches precipitation falling within its boundaries and funnels it downhill through the systems of tributary streams and rivers to a single outlet. Whatever the flowing water picks up along the way is transported down the watershed. Thus, watershed boundaries are the earth's natural boundaries, dividing the landscape into individually defined areas that are each inextricably woven into a common fabric. Tug one end and the whole cloth wrinkles.

1.0 THE WATERSHED APPROACH

Protection of our increasingly scarce surface and ground water resources is vital to our livelihood and well-being. To better provide sound and cost-effective water quality management and safeguard the well-being of citizens throughout Arizona, the Arizona Department of Environmental Quality (ADEQ) is launching a statewide approach to water quality protection. This approach places the focus on individual watersheds, emphasizing the interdependence of water quality and the activities of communities within each watershed.

The basic concepts of cooperative watershed-based environmental management are not new. Many local watershed initiatives have sprung from concern that the myriad of highly specialized federal, state, and local laws do not guarantee a healthy environment. Ultimately, ADEQ is obligated to uphold the law, but confrontational approaches to environmental protection—enforcement actions, penalties, fines, and other sanctions—are limited in their effectiveness and sometimes act as barriers to resolving environmental problems.

Successful watershed efforts in all parts of the country demonstrate that voluntary collaboration with all interested parties is the best way to provide durable solutions. Recognizing these successes, governmental agencies at all levels are uniting with citizen groups, business, industry, and tribal organizations to design and implement individual watershed protection and restoration efforts. ADEQ's statewide watershed framework is intended to provide a consistent yet flexible guide to achieving watershed protection in the coming years.

Protection of water resources within individual watersheds

Laws alone do not always protect the environment

Voluntary collaboration is critical to successful water quality management

Watersheds are practical management units because they integrate the environment—air, land, water, biota—and the ecological processes that define water quality. The term “integrated” is used to mean that the processes function as a system rather than as a collection of unrelated features. Figures 1-1 and 1-2 illustrate examples of the natural and human factors that affect water quality within a watershed. ADEQ will focus on the interrelationships of the chemical, physical, and biological factors that comprise a watershed’s ecology as a scientific basis for water quality management decisions.

A watershed is the geographic delineation of an entire waterbody system and the land that drains above a certain outlet point. By selecting the location of the outlet point, a watershed can be made larger or smaller; smaller watersheds can nest within larger watersheds. The watershed management zone can then be defined to match the geographic scale of the problem to be addressed. The Arizona watershed approach includes the ground water areas that have some form of hydrologic connection with the surface waters.

In the watershed approach, community-based partnerships between local sponsors and partners determine the focus of efforts. ADEQ may assume the lead role only as the result of a negotiation or in the early stages of the process while local partnerships are forming. ADEQ believes that partnerships based on cooperation and mutual understanding have the best foundation for finding solutions that reduce or eliminate the need for formal compliance and enforcement actions. ADEQ's role can evolve into one of providing support to local sponsors and partners to guide decision-making on local issues. ADEQ believes the watershed approach is the key to successfully fulfilling its mission.

Community-based
partnerships

1.1 WHAT IS WATERSHED MANAGEMENT?

Watershed management is a resource-centered approach. Success is measured in terms of improving and maintaining environmental quality and protecting public health. Implementation fosters the protection and restoration of specific water uses, such as drinking water supply, aquatic life habitat and propagation, recreation, and irrigation. Sound water resource management decisions depend on understanding the relationship between water quality, water use, and conditions within the watershed.

Improve
environmental
quality and protect
public health

Figure 1-1.

Natural Factors Affecting Water Quality

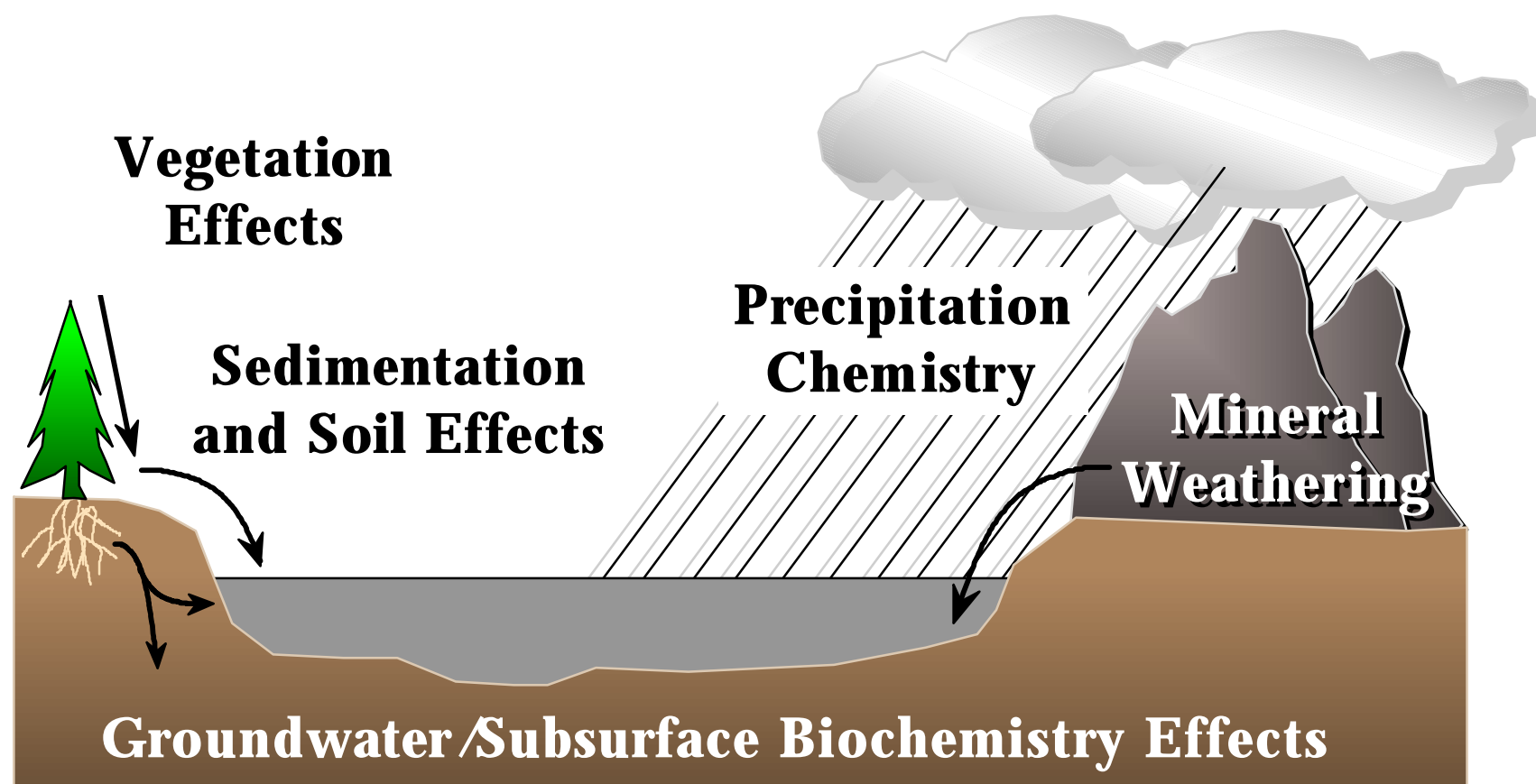
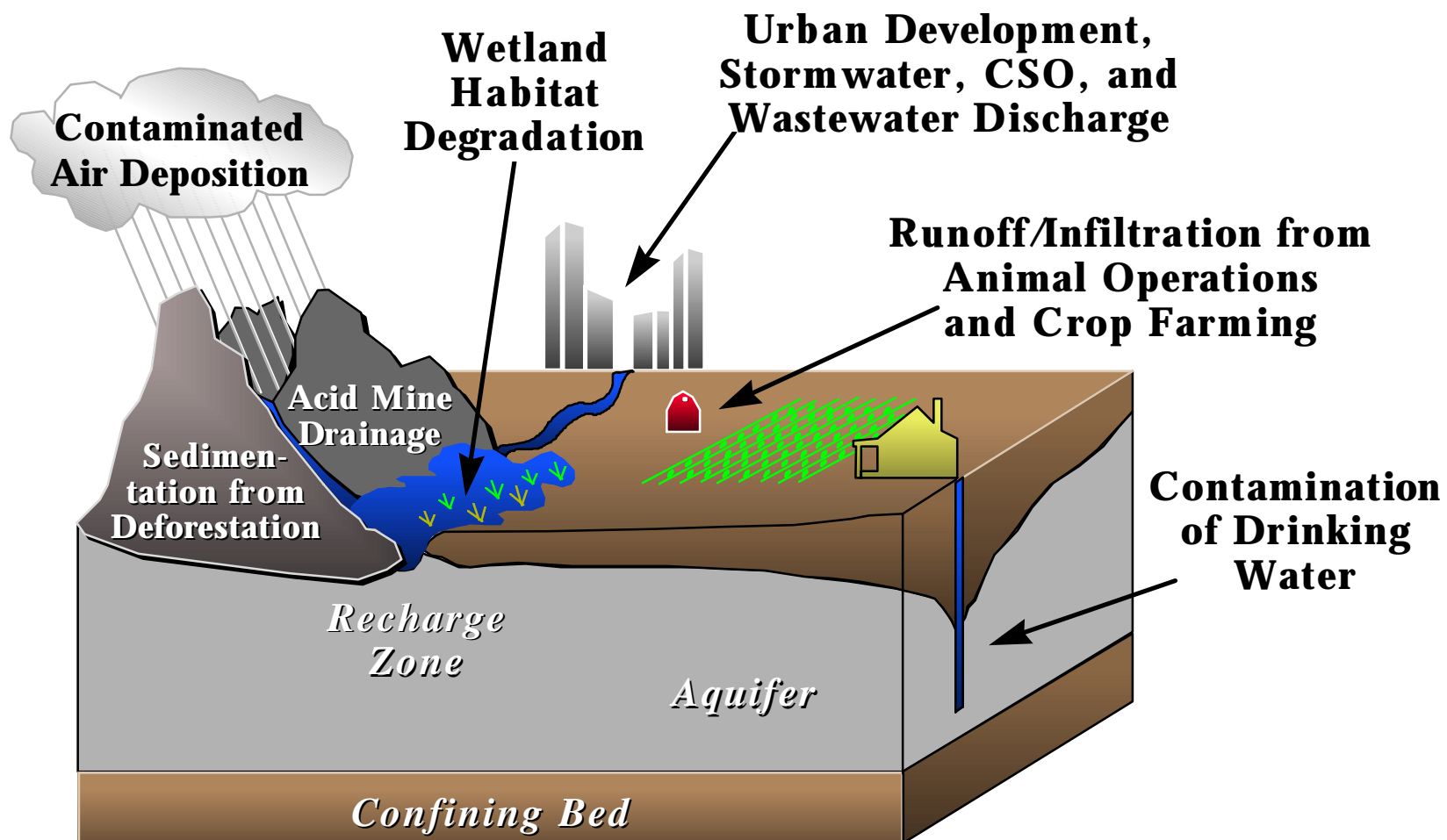


Figure 1-2.

Human Factors



THE COMPLEXITY OF
WATERSHED MANAGEMENT

- The interrelated nature of the environment,
- Complex interrelationships between the environment and the economy (including consideration that our livelihood depends both on maintaining healthy ecosystems and balancing relative environmental and economic risks), and
- The fragmented nature of many of our environmental laws that are the legal authority for the very existence of the Arizona Department of Environmental Quality as well as every action that the department takes.

Accurate watershed assessments based on representative data and targeted monitoring are therefore essential components. Assessments characterize physical, chemical, and biological conditions of water bodies, identify sources and causes of water resource contamination and degradation, and evaluate the effectiveness of alternative management actions. The culmination of watershed-based assessments is the implementation of regulatory and nonregulatory solutions that address local water resource problems. These watershed management activities are interdependent and encompass numerous functions. Several different programs and agencies perform these activities, so significant coordination is essential to successful management.

The three essential components of Arizona's approach to watershed-based environmental management are

- (1) having a common geographic focus,
- (2) synchronizing activities within geographic areas, and
- (3) fostering local stakeholder interest and involvement in the process.

The stakeholder component includes establishing partnerships among citizens, business groups, environmental advocates, and governmental agencies at all levels to advance the development and implementation of comprehensive watershed agreements.

1.2 THE STATEWIDE WATERSHED STRATEGY

The administration of Arizona's environmental laws and regulations is a complex task and can be at times difficult, unpopular, and even controversial. Statewide watershed management is not a new regulatory *program*, rather it is a new *approach*. The Clean Water Act (CWA) includes many references to and options for watershed-based activities. The 1996 amendments to the Safe Drinking Water Act add new requirements for source water protection activities, which generally translate to watershed (and associated ground water basin) protection. Numerous programs, such as the Natural Resources Conservation Service's technical assistance to farmers, use watersheds as their geographic management unit. However, only in the past few years have efforts to manage watersheds cooperatively and comprehensively taken hold.

The maturing view of the government's role in environmental management recognizes the complex needs of society and the interrelationship between the economy and the environment. Adequate accounting for these complexities is impossible without direct involvement of individuals who are most impacted by the decisions) those who live, work, and support (through their taxes) the institutions responsible for protecting the environment.

As water flows downhill, pollution discharged to the upstream segments impacts the downstream segments of the same river system. As water combines with pollution discharged from downstream sources, the effects are cumulative. Political or administrative boundaries do not often coincide with natural watershed boundaries. Efforts to manage water resources can therefore realize only limited success when the planning and implementation of water quality management activities begin and end at those jurisdictional lines.

This framework for managing water quality on a watershed basis has the following objectives:

- ◆ Form partnerships with local communities to set priorities and make decisions,
- ◆ Encourage fair and equitable decisions through public involvement,
- ◆ Coordinate environmental planning and implementation with other agencies and governments,
- ◆ Allocate ADEQ resources to achieve more efficient, effective and responsive customer service,
- ◆ Provide a sound technical basis to support environmental decisions, and

Water resource management crosses jurisdictional lines

- ◆ Provide a forum to foster continuous evaluation and improvement of environmental programs and regulations.

1.3 RATIONALE FOR ADEQ'S COMMITMENT

Nearly one-third of all the states have already adopted or are in the process of developing a statewide watershed approach. This national shift to a watershed approach has reached the point where key federal agencies, including the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (USACE), and the Department of Interior (DOI) are all supporting watershed initiatives, both financially and with technical expertise.

ADEQ brought several years of experience using watershed-based environmental management to the design of the proposed statewide framework. The work of the Nonpoint Source Pollution Program—which generally deals with impacts of farming, ranching, and urban runoff—has led to the establishment of local advisory groups in the Verde River Valley and the Upper Gila River Valley. As part of the framework design process, the Water Quality Division (WQD) within ADEQ investigated how to expand this concept to include a broader array of water quality programs.

The common geographic focus and synchronization of activities enables ADEQ programs, as well as those of other government agencies, to work together instead of separately, so work can be sensibly divided instead of duplicated. The watershed approach can therefore be more cost effective and can also guide the budgeting and allocation of resources. And finally, by accounting for ADEQ activities by watershed, the connection between expenditure of taxpayer dollars and the services rendered becomes clearer to the citizens who pay the bills.

Watershed initiatives nationwide

Sensible division of workload and clarified accountability

1.4 TAILORING THE APPROACH FOR ARIZONA

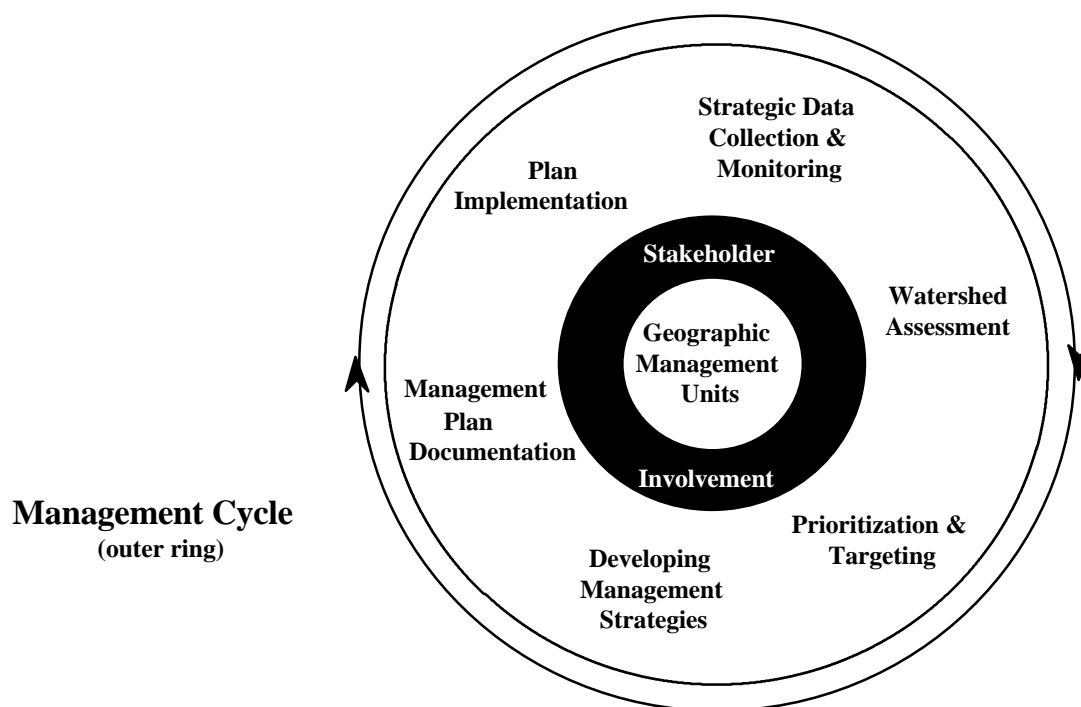
Arizona has tailored the watershed framework to address our own individual circumstances:

- ◆ The integration of ground water and surface water considerations,
- ◆ Linking the goals, objectives, and needs identified by watershed partnerships to ADEQ staff assignments and budget allocations, and
- ◆ A high level of coordination of water quantity and water quality considerations.

The initial design of the statewide watershed framework was accomplished over approximately a year and a half by an interprogram ADEQ work group comprised of staff with many different levels of authority and experience. The goal of the facilitated work group process was to consider and reach consensus on a series of topics before incorporating them into the framework.

These topics were based on the nine essential elements of a watershed approach: geographic management units, stakeholder involvement, statewide and watershed scheduling cycles, strategic monitoring, watershed assessment, priority-setting and targeting, capability to develop watershed management strategies, management plan documentation, including written watershed agreements, and implementation (Figure 1–3). Decisions based on consensus were documented in work group meeting summaries; these decisions form the basis of this framework document.

Figure 1-3. Essential elements



While the original mandate called for the work group to consist solely of ADEQ staff and to work internally, the group recognized the pitfalls of proceeding in a vacuum without external input. To counter this without violating its in-house mandate, work group members assumed responsibility for communicating with other ADEQ staff and potential partners outside ADEQ to ensure their continued input to the process. This communication strategy allowed the work group to maintain an open and inclusive design for the framework that facilitated voluntary collaboration with other potential watershed partners. The regular liaison activities of the work group included, but were not limited to, the Natural Resources Conservation Service (NRCS), Councils of Government (COG), Arizona Department of Water Resources (DWR), U.S. Environmental Protection Agency's Region 9, key citizen participants in existing watershed associations, and the State Natural Resources Coordinating Committee (NRCC).

Communication strategy

Although a watershed approach will not solve all problems related to water quality and quantity, ADEQ staff have identified several areas where a watershed approach is expected to have the greatest benefit:

Benefits of the watershed approach

- ◆ This approach gives the public a greater role in developing and implementing water quality management activities.
- ◆ This approach will not significantly impact ADEQ's work load. The approach will, however, increase the use of decentralized teams and put ADEQ staff in direct contact with those to whom they are providing service for the protection of water quality. Staff efforts will shift away from reactive crisis management to more proactive activities.
- ◆ Program staff and budget resource shortages are expected to continue. The watershed approach provides opportunities for collaboration among programs and agencies to augment resources, to set priorities and targets for making the best use of limited resources, and to keep public stakeholders aware of these limitations.
- ◆ Public involvement, strategic monitoring, watershed assessments, and priority-setting promote the use of environmental indicators that are keyed to individual watershed conditions. These indicators make possible sound management decisions based on improved use of environmental information and solutions tailored to local needs and problems.

Participation & involvement of Arizona citizens

Better use of ADEQ resources

The *Statewide Watershed Framework* will reinforce several other ongoing objectives, such as analyzing comparative risk, inventorying comprehensive needs, and developing total maximum daily load (TMDL) allocations for the restoration of degraded streams and rivers.

In developing the watershed management framework, the work group wanted to have a clear picture of how each ADEQ program and other watershed partners could fit together and to document details of the strategy for implementing watershed-based management across the state. The development effort benefitted from the experience of other states that have already designed and implemented similar approaches and also from input solicited from other government agencies and citizens involved in water quality issues, such as the nonpoint source advisory groups.

This document will be refined as the approach itself changes and expands and as stakeholders continue to provide input on how to best address Arizona's particular needs. Experience gained through long-term implementation of the statewide watershed approach will provide more detailed solutions to the following list of issues.

- | | |
|---|---|
| <ul style="list-style-type: none"> ◆ Incorporating the range of legal requirements within a watershed plan, such as the various requirements included in the Clean Water Act, specifically Sections 208 (Areawide Waste Treatment Management Planning), 303 (Water Quality Standards and Implementation Plans), and 305(b) (State Reports on Water Quality); | <p>Consolidation of planning and reporting requirements</p> |
| <ul style="list-style-type: none"> ◆ Providing ready access to water quality and other environmental data in the absence of comprehensive and user-friendly databases and guiding the development of ADEQ's Arizona Unified Repository for Informational Tracking of the Environment (AZURITE) database, which is currently underway; | <p>Access to data</p> |
| <ul style="list-style-type: none"> ◆ Detailing the public review process for the framework document and review and approval of individual watershed plans; | <p>Public review process</p> |
| <ul style="list-style-type: none"> ◆ Incorporating Nonpoint Source Management Zone, Comprehensive State Ground Water Protection Program, and Safe Drinking Water Act Source Water Protection and Revolving Fund activities within the watershed framework; and | <p>Merging ongoing activities</p> |
| <ul style="list-style-type: none"> ◆ Making the transition from ADEQ annual and strategic budgets and work plans to the watershed approach. | <p>Transition</p> |

1.5 CONSOLIDATED WATER QUALITY MANAGEMENT OBJECTIVES UNDER THE WATERSHED APPROACH

ADEQ will use the watershed approach as a practical means to consolidate and fulfill many of the Department's objectives and activities. This is possible because many monitoring, assessment, and management activities will be coordinated within the watershed framework. The watershed framework also provides other watershed partners with the opportunity to consolidate and fulfill many of their objectives. Consolidation within the watershed framework improves effectiveness and efficiency because many overlapping objectives can be addressed simultaneously, rather than through separate efforts. The following list of activities to be fulfilled through the watershed framework focuses on ADEQ and EPA Region 9's functions and required products and is not meant to be inclusive or exclusive of other watershed partner objectives that will be fulfilled through the watershed framework.

Arizona Department of Environmental Quality

The Water Quality Division within ADEQ will fulfill the following and other objectives that may be proposed in the future within the watershed approach.

Aquifer Protection Program Permits; Wastewater Reuse; and Dry Well Registration: ADEQ responds to APP permit requests on an as-needed basis. However, the Water Protection Approvals and Permits Section will incorporate stakeholder outreach, monitoring and assessment, registration, and management activities unrelated to permit issuance into watershed initiatives.

305(b) Water Quality Assessment Report: The 305(b) report is a biannual requirement of the Clean Water Act providing a statewide assessment on the status of Arizona's waters, their support of designated beneficial uses and sources and causes of water quality impairment. In the past, the 305(b) report was updated every two years with information from assessments that have been completed for watershed management zones during that period. However, EPA is in the process of drafting new guidelines requiring a full paper report every five years, which will correspond with the statewide watershed cycle. The 305(b) report will have updated information for the entire state at the end of each five-year cycle. States no longer need to prepare biennial paper 305(b) reports. Instead, hard copy reports are due every five years with annual electronic updates of a subset of data elements, which can correspond with the watershed that is being focused on for that period. The first annual electronic update will consist of assessment information for the first calendar year of the implementation of the state's watershed framework. The strategic monitoring plans that are used for assessment under the watershed approach will lead to an improved information base for the report. ADEQ's monitoring strategy will be coordinated through the watershed approach, including the use of monitoring plans to support the statewide assessment undertaken to fulfill 305(b) requirements. A strategic monitoring plan will be developed and implemented for each watershed management zone.

Triennial Standards Review: Arizona is required by the Clean Water Act to update and recertify its statewide water quality standards every three years to ensure that designated uses are protected. The standards review will become a regular feature for each watershed management zone. That is, the appropriateness of standards will be assessed for each watershed management zone. The Triennial Review will be updated with the results of watershed management zone assessments that have been completed in the three-year period. Again, at the end of each statewide cycle, a comprehensive review of all the applicable water quality standards in watershed management zones throughout the state will have been completed.

Site-specific Standards Determination: The watershed management steps developed by ADEQ for the framework are consistent with the process necessary to develop a site-specific standard. In locations where stakeholders have determined that revision of a water quality standard is a significant priority, the watershed process will be used.

303(d) - Listing of Quality-limited (Impaired and Threatened) Waters: Section 303(d) of the Clean Water Act requires the state to identify and list all waters not achieving water quality standards that are currently in compliance with Clean Water Act regulations (e.g., NPDES permits). The assessments conducted for each watershed management zone will update the existing 303(d) impaired waters lists as appropriate.

303 (d) - Development and Implementation of Total Maximum Daily Loads (TMDLs): The beneficial uses of impaired waters on the 303 (d) list must be restored through the TMDL process if existing technological controls are inadequate for the waters to support their beneficial uses. The watershed approach is a logical method to develop all of the elements of a TMDL. Watershed plans can include a problem statement, numeric endpoints or targets, a source analysis, linkage of endpoints to the source analysis, allocation of pollutant loading reduction responsibilities, and monitoring and adaptive management plans. ADEQ will use the targeting element of the watershed planning and implementation steps to allocate resources to complete the analyses necessary to support recovery strategies for impaired waters. The implementation element of the watershed approach is also consistent with the TMDL guidance from EPA Region 9 which includes a well-defined management strategy as an essential TMDL component.

Section 319 Nonpoint Source Grant Funding: ADEQ will update and implement the State Nonpoint Source Management Plan. The plan will incorporate the watershed framework into the overall planning effort. Watershed teams will identify non-point source funding priorities with the help of participating stakeholders. The Nonpoint Source Unit will provide input on project design, guide implementation, and track the progress of funded projects.

State Revolving Fund Loan Program (SRF): ADEQ will use the watershed framework to identify and develop candidate projects for participation in the state revolving fund loan program. ADEQ will work with the Arizona Wastewater Management Authority to include these projects in the SRF priority and intended use plan. ADEQ will use the watershed process to expand the Arizona Wastewater Management Authority's efforts to address stakeholder needs and as a forum for communicating program requirements and procedures. ADEQ views the watershed framework as an effective method for increasing local participation in the allocation of SRF funds and to supplement or complement other funding components of the federal Clean Water Act, State Drinking Water Act - and state programs.

Safe Drinking Water Act - Source Water Assessment and Protection Programs: ADEQ is developing guidance to local water providers to develop and implement source water assessment and protection programs. Source water assessment and protection programs will be incorporated into the watershed framework because much of the information and management activities that compose source water programs is supported by other water quality management activities.

Safe Drinking Water Act - Public Water System Supervision (PWSS): Certain components of the drinking water program, such as the Wellhead Protection Program, will also be addressed within the watershed framework. To the best of its ability, ADEQ will address source water delineation and assessment, monitoring waiver determination and permanent monitoring relief within the watershed framework.

State-EPA Performance Partnership Grants: Many of ADEQ's programs derive from federal laws that have been adopted in state statute. Specific sections of the federal laws provide funding for states to administer these programs through separate categorical grants, essentially federal-state contracts. EPA and ADEQ are pursuing development of a Performance Partnership Grant (PPG) which combines various categorical grants into a single grant. Under a PPG, a unified view of the state's environmental needs is translated into a work plan for staff and budget allocations designed to match those needs. Categorical grants are apportioned across the overall work plan budget in accordance with the particular federal law authorizing each grant. This enables better coordination across programs and greater harmony between environmental needs and program budgets. The administrative burden of tracking multiple grants is simplified as well.

The statewide watershed framework is well suited to provide the documentation of the state's environmental needs required for developing the PPG work plan. It does this by taking a unified view of each watershed, establishing a schedule for coordinating activities in a planned sequence around the state, and utilizing local advisory groups to develop regional strategies.

U.S. Environmental Protection Agency Region 9

National Pollutant Discharge Elimination System Permits (NPDES): EPA Region 9 has established a schedule for reissuing NPDES permits on a watershed basis. The process for developing permits provides the foundation for many other water quality management activities.

Endangered Species Act (ESA) Consultations: The ESA requires that all federal agencies consult with the U.S. Fish and Wildlife Service for activities that may impact listed species. The consultation process will be incorporated into the watershed planning and implementation process. In addition, the watershed framework may, in certain areas, help promote the development and implementation of habitat conservation plans that allow landowners to continue using property located within areas designated as critical habitat.

It is important to note that every watershed initiative will be tailored to the needs of affected stakeholders. The functions and products described are only a small sample of what can be addressed through the watershed approach. The operating principle is to consolidate as many functions and products within a common process defined by the watershed approach as is practical. However, each watershed plan may not include all of the functions and products described above. For example, some watershed management zones may not need stormwater management plans. Participating partners will not direct resources to those areas that have not been targeted as a watershed priority and stormwater management plans will not be discussed in the watershed report or implementation plan. This does not mean, however, that stakeholder groups can choose which mandatory regulations to address or ignore. ADEQ and other agencies bring some requirements to the watershed forum that must be met. Nevertheless, the watershed approach does allow for more cost-effective and flexible solutions to be considered.

1.6 SUMMARY

Careful consideration of all pollution sources within the watershed can identify ways to significantly reduce pollution relatively inexpensively. Competing interests need a forum to reach agreements; a watershed framework provides that forum. By bringing the variety of interests to the table at the same time, new options for water quality management can be explored.

Collaboration opens new options

Developing an optimal balance of nonpoint and point source pollution loading controls, habitat restoration, and appropriate classification of stream segments will contribute to a cost-effective water quality protection strategy. Restored habitat, such as wetlands, will contribute to a waterbody's ability to respond to pollutant stressors and will help maintain essential biological integrity. Additionally, innovative policies, such as pollutant trading, can more easily be implemented with a watershed approach. If the end result is reduced overall pollution in the watershed at an economic savings, both the environment and the economy benefit.

The purpose of this watershed framework is to provide the capability to administer ADEQ programs in concert with each other, with those of other agencies at all levels of government, and especially with the most important level of government—the citizens themselves. This framework document describes the major components of ADEQ's approach and explains how each component will help achieve the agency's goals and objectives. The following sections provide background information and guidance for staff within ADEQ and for watershed partners outside the agency on integrating and coordinating key functions through a watershed approach. Roles and responsibilities for specific ADEQ, other governmental, and nongovernmental programs are identified, along with a plan for a smooth transition to implementation.

The watershed approach can form the basis for a renewed partnership between the citizens and their government. An open, cooperative process that strives to achieve mutually beneficial results can help to limit the creation of environmental policy by decree or courtroom decision. We can negotiate our differences and create a better future for the next generation.

Bringing back the natural
resilience of the environment

SECTION 2

THE WATERSHED APPROACH AND HOW IT WORKS

Arizona's watershed approach framework is designed to achieve three objectives: increase the level of public involvement; improve coordination of ADEQ activities; and develop consistent collaboration between local, state, and federal agencies.

2.0 CORE ELEMENTS

Four core elements provide the foundation for coordination and citizen involvement:

- ◆ **Watersheds:** The spatial basis for coordinating activities.
- ◆ **Watershed Management Cycle:** A series of steps that stakeholders may use to coordinate targeted watershed management objectives. The watershed management cycle includes a statewide sequence; this is a calendar for conducting key management activities in each watershed. Both provide temporal coordination of resources.
- ◆ **Stakeholder Involvement:** Procedures and advisory groups that reflect ADEQ's effort to involve citizens throughout the watershed management cycle to achieve greater input, understanding, and support for implementation of management strategies.
- ◆ **Watershed Plans:** Written agreements (i.e., a common product among watershed partners) that guide implementation of resource management strategies to address issues of concern.

These four elements are supported by the following five activities that are described in this and later sections:

- ◆ **Strategic Data Collection and Information Management:** Activities for gathering all relevant information needed by advisory committees and watershed teams for watershed management decisions (Section 3).
- ◆ **Watershed Assessment:** The interpretation and reporting of information collected on a watershed, including development of specific watershed environmental indicators and measures of success (Section 3).
- ◆ **Listing and Targeting Environmental Concerns:** A negotiated process for determining where resources should be directed to most effectively restore or preserve water quality (Section 3).
- ◆ **Developing Collaborative Watershed Management Strategies:** An essential capability derived from a support structure that coordinates efforts of all participating partners (Section 2).

- ◆ **Implementation:** The ultimate focus of all elements to deliver resources and expertise to areas in need. A defined cycle length and written agreements are two tools for facilitating implementation of water quality management activities. (All Sections).

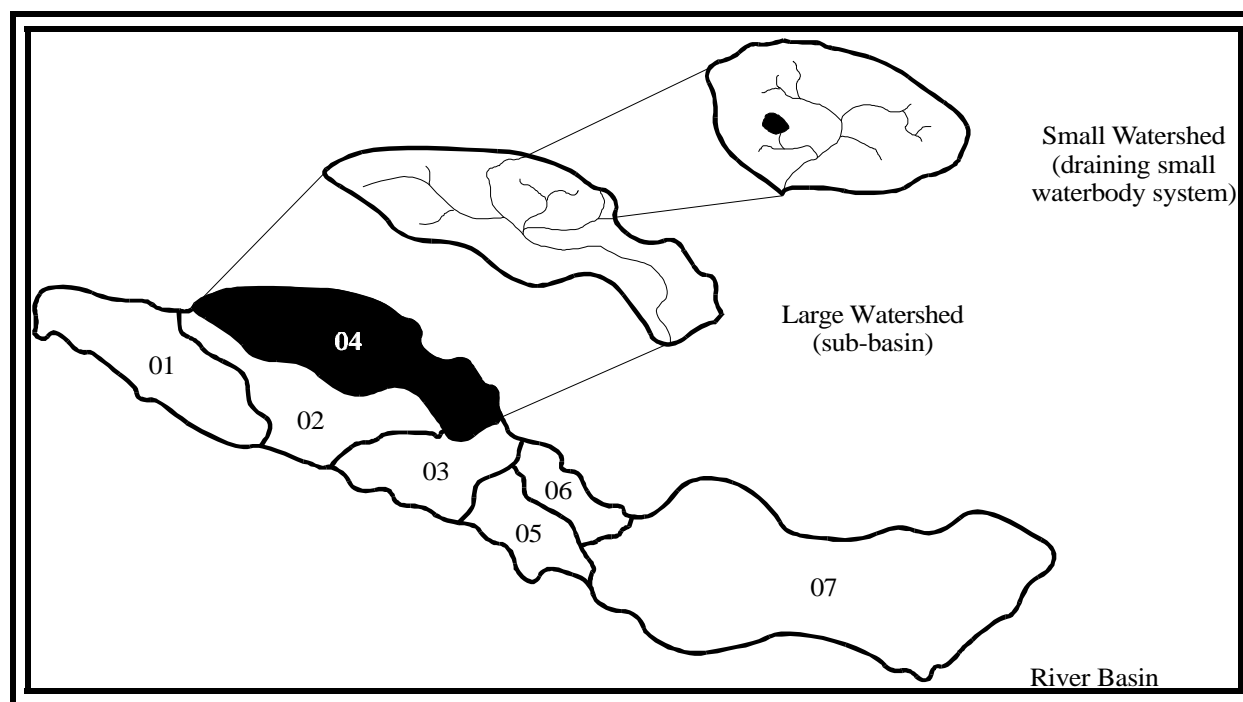
All these elements working together form the statewide watershed framework leading to improved integration and coordination of water quality management activities.

2.1 WATERSHEDS

The first structural element of Arizona's watershed approach is the geographically defined management area. Participating programs and agencies will use a common set of *nested* hydrological units to focus and coordinate their activities. As illustrated in Figure 2-1, nesting refers to how the boundaries of larger hydrological basins encompass the boundaries of other smaller discrete hydrological units that drain to a common point. This characteristic of geographic management areas based on hydrological units allows a watershed team to focus their efforts at the appropriate geographic scale. Smaller or larger drainage areas can be targeted depending on the scale or magnitude of the problem.

Using hydrologically defined geographic management units improves the coordination of programs and agencies. Management units also encourage a sense of "ownership" among residents and other stakeholders. The delineation of geographic management unit boundaries considers factors that group stakeholders into areas sharing common environmental characteristics. Boundaries provide a context for evaluating the environmental consequence of stakeholder activities, as well as a functional basis for evaluating the impact of stressors on commonly shared resources. ADEQ has delineated geographic management unit boundaries building on existing nonpoint source management zones. These management units are being referred to as watershed management zones. Watershed management zones should provide realistic scales for better understanding the impacts of management actions. Organizing the approach around watershed management zones places ADEQ and stakeholders in a better position to articulate environmental objectives and develop management strategies that address local and regional concerns.

Figure 2-1. Nested Hydrological Units



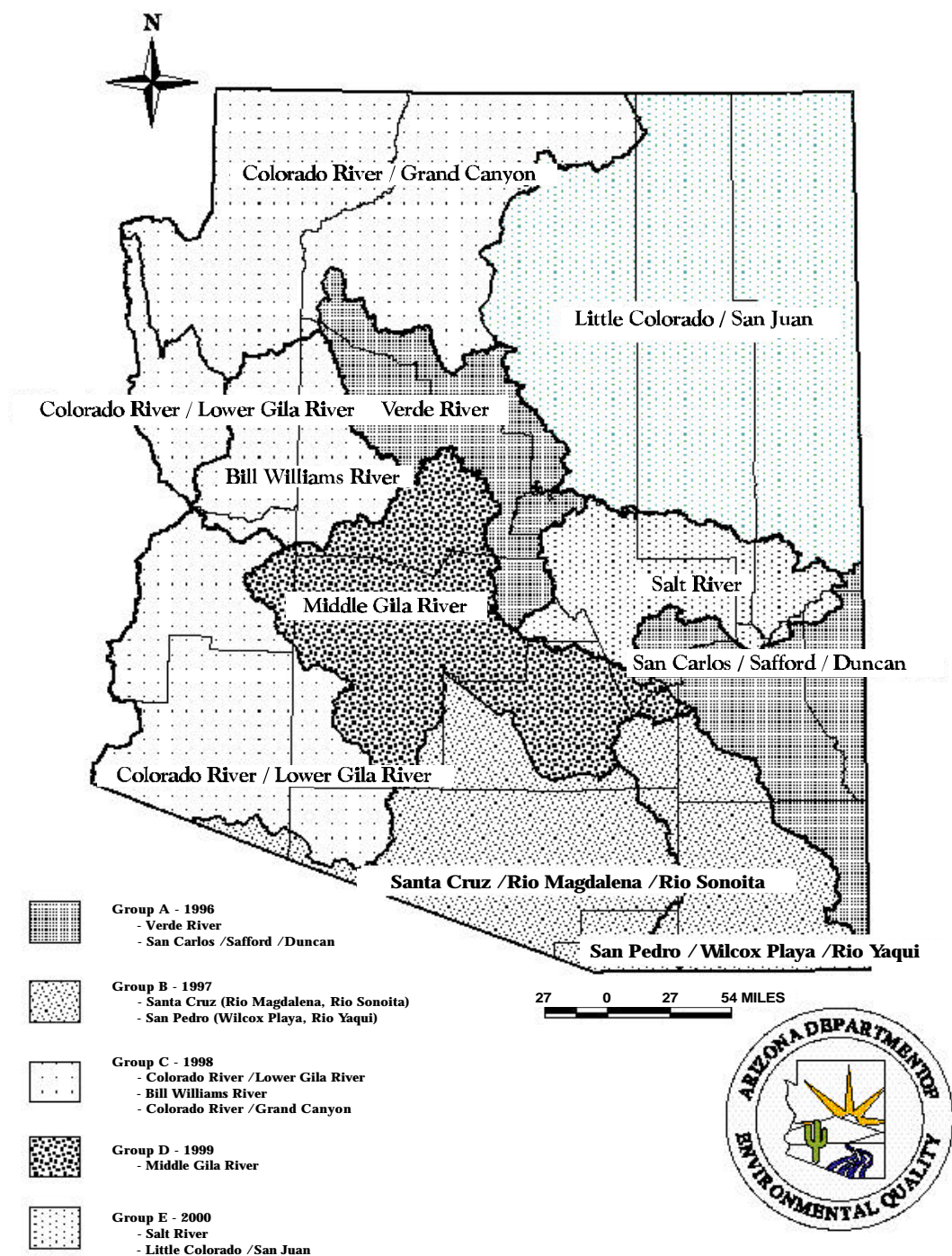
2.1.1 Watershed Delineation

The basis of watershed management is hydrologic delineation of the watersheds themselves. This process combines locating geographic boundaries of the watersheds on a scientific basis with determining how fine a resolution to use for management purposes from an administrative perspective. The hydrologic boundaries are based on elevation and the contour of the land surface and thus are readily determined from topographic maps. The U.S. Geologic Survey (USGS) has established a system of Hydrologic Unit Codes to identify each stream and river section and lake in the nation with a unique number. Other agencies, such as the Arizona Department of Water Resources, have also delineated the state's watersheds using Hydrologic Unit Codes. The USGS system forms the basis for delineating Arizona's watersheds.

Each watershed contains many smaller subwatersheds, such as a small creek that drains into a major river system. For example, all Arizona land ultimately drains to the Colorado River, with the exception of certain areas which drain through Mexico to the Sea of Cortez and a few closed basins such as the Wilcox Playa (a dry lake). The question then becomes how finely to divide the state into manageable areas. The process of dividing and aggregating these watersheds is a matter of judgment, taking into account such factors as constructed boundaries (e.g., Painted Rock Dam, Granite Reef Diversion Dam, and their associated canal systems), common cultural and economic bases, location of population centers, and common sense. Combining Wilcox Playa and Rio Yanqui with Santa Pedro River is one example of this process. The ten watersheds that have been initially identified across Arizona are illustrated in Figure 2-2.

Surface water and ground water are closely interrelated. Ground water is water that has percolated into the ground and occupies spaces between soil particles or cracks and fissures in otherwise solid rock. All ground water was initially surface water that fell as rain or snow. Ground water behaves in a manner similar to, but more complex than, surface water. It generally either seeps downward and laterally until it intersects the surface (either a lake, perennial stream, or natural spring) or it settles into a trapped basin where underlying bedrock prevents it from seeping deeper into the ground. Surface water that flows when there has not been recent precipitation is generally ground water that intersects a depression in the land surface, such as a river channel or lake development. Moreover, unusually wet seasons, droughts, large-scale pumping of ground water, and seasonal runoff events along major streams that are normally dry can change the depth, location, and flow direction of ground water.

Figure 2-2. Arizona's ten delineated watershed management zones



Ground water is especially important in an arid state like Arizona; hence, ground water protection is a major goal of the watershed framework. The Arizona Department of Water Resources has identified the ground water basins in the state. Most of these basins correspond to surface watersheds. (This has been demonstrated by superimposing the basin boundaries onto surface watersheds.) Therefore, surface watershed boundaries can generally be used to incorporate ground water protection into the watershed approach.

Ecoregions are also an important consideration in natural resource management issues. An ecoregion overlay can provide information on important characteristics of a watershed, especially when endangered species or species diversity are decision-making issues. For example, a particular habitat type may be common in a particular watershed yet scarce elsewhere in the ecoregion. If this is the case, this habitat would be placed in a category of the highest level of concern, increasing the likelihood that it would be targeted for restoration or preservation.

2.1.2 Criteria for Delineating Watersheds

The work group used several criteria to evaluate potential boundaries for watershed management zones. The work group did not require that each criterion be met 100%. Rather, the group sought a balance among the following criteria to increase the possibility that potential partners would be able to adopt common management units:

- ◆ Is the integrity of surface water hydrological units maintained for assessment and management of cumulative effects (e.g., pollutant loading, hydrological modification, and land-use effects) within an integrated ecological unit?
- ◆ Can land uses be identified for the opportunity to emphasize a set of solutions and necessary expertise within a common management unit (e.g., best management practices for mining versus best management practices for grazing or agriculture)?
- ◆ Do prevailing socioeconomic factors provide for any common ground among stakeholders? Do stakeholders share other common interests that would reinforce their commitment to the watershed management zone?
- ◆ What is a realistic number of watershed management zones for ADEQ and other watershed partners to administer?
- ◆ Are population centers divided between watershed management zones? Given that population centers represent a high concentration of permitted activities, is there an even distribution of this workload across watershed management zones?
- ◆ Does a particular boundary offer the opportunity to focus efforts on a similar set of problems or solutions?

- ◆ Are there existing administrative boundaries that could be adopted for the watershed management zones?
- ◆ How do proposed boundaries treat transboundary issues with other states? With Mexico?
- ◆ Is the planning and implementation scale suitable for integration with local stakeholders? Is the scale of sufficient size to encourage consistency and equability statewide?

The selection of hydrological units with nested watersheds was based on the belief that it represented the fewest barriers to the largest number of potential watershed partners. Also, watershed management zones are not prescriptive. Issues that do not match adopted boundaries can be accommodated by increasing the spatial scale under consideration (e.g., ecoregional issues and statewide permits) or by forming a team for an area that crosses watershed boundaries (e.g., ground water or discharge areas).

2.2 WATERSHED MANAGEMENT CYCLE

Perhaps the most important concept in statewide watershed management is the focus on specific aspects in a sequenced and iterative manner. That is, during any single year, programs and activities (such as detailed monitoring) will be emphasized in an individual watershed. During the following year, monitoring efforts would be focused in the next watershed in the sequence. As a management tool, sequencing within the watershed approach will guide budgeting and allocation of ADEQ resources in more effective and efficient ways. Key activities will focus on different regions of the state on a rotating basis, enabling a thorough job to be done in each area in turn, rather than a less intensive job across the entire state at the same time.

Not every water quality management program or activity fits well within a cycle: inspection of public drinking water systems, emergency removal or remediation of hazardous contamination, compliance and enforcement cannot be synchronized, and therefore need to be distributed across the state at all times. However, certain facets of these programs can support the cyclical watershed approach. For example, if compliance with safe drinking water monitoring and reporting regulations is a problem in a particular area (assuming no imminent threat to public health exists), targeting outreach and technical assistance may help water suppliers in a particular area come into compliance in conjunction with the watershed cycle. Likewise, maintaining fixed-station, ambient water quality monitoring may be needed to identify long-term trends in water quality. Perhaps half of the monitoring resources could be focused on one or two watersheds in any given year, while the remaining half is spread throughout the state.

By establishing a standard cycle, stakeholders and partners having an interest in a particular watershed can meet to pool resources for planning and implementing watershed management activities in a unified and mutually supportive manner. The proposed timing of activities for the ten watersheds illustrates a transition from the traditional approach to the watershed approach over a five-year period. Once the transition is completed, all watersheds in the state would have some activity occurring, but each would be at a different point in the cycle.

The management cycle has three features that create an orderly system for focusing and coordinating activities on a continuous basis: (1) a specified length of time for each iteration of the watershed planning and implementation steps, (2) a statewide sequence for addressing watersheds, and (3) a schedule of activities for each watershed. ADEQ's decisions regarding all three features, as adopted for the statewide watershed framework, are described below.

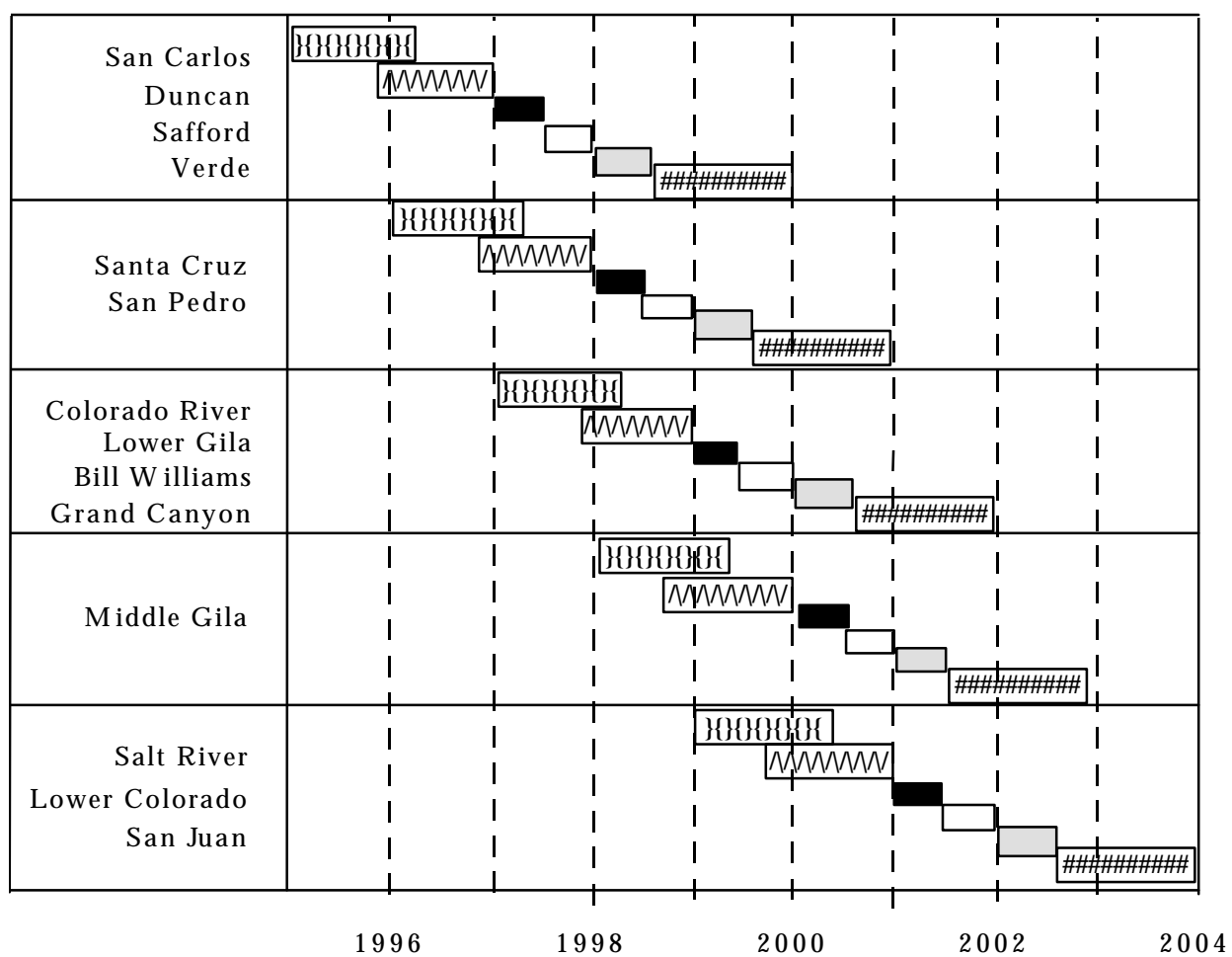
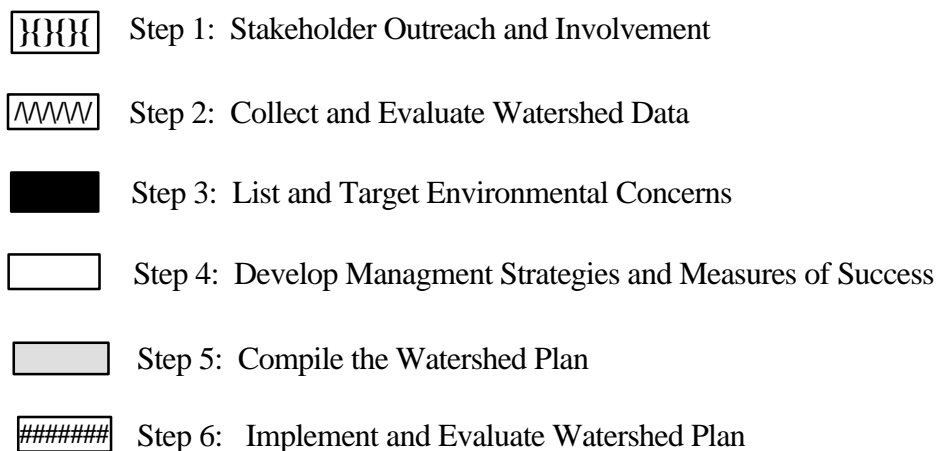
2.2.1 Planning and Implementation Steps

Six steps have been identified for developing and implementing a regional watershed plan (Figure 2-3). These steps establish a consistent way to plan and manage water quality throughout the state, while still maintaining the flexibility to accommodate the unique character of each watershed. Below is a description of the purpose and activities of each step.

Step 1. Stakeholder Outreach and Involvement: This step involves identifying and bringing together potential stakeholders and enlisting their leadership and involvement in the decision-making process. An integral part of this step is to create a community profile that characterizes stakeholders' perceptions, values, interests, and concerns regarding environmental issues in the watershed. Stakeholders might include federal, state, and local governmental agencies; tribes; property owners; environmental organizations; industries; and citizens who live and work in the watershed. Ideally, one or more of the stakeholders would represent an established organization that could act as local sponsor for the watershed process.

ADEQ based its decision to initiate implementation of the watershed approach in the Verde River and Upper Gila River watersheds on the existing nonpoint source pollution control activities in those areas and the success of advisory groups in those nonpoint source pollution management zones in directly involving the watershed's inhabitants in decision-making.

Figure 2-3. 6 Watershed Steps and Implementation Sequence



The goal of whole-watershed planning is a watershed characterization document. This step includes identifying stakeholders, conducting outreach, providing background information, identifying known information gaps, formulating goals and objectives, and conducting a general awareness campaign. A draft characterization document would be compiled prior to the formation of a local advisory group and would include existing water data, a general description of the culture and economy of the area, its population centers and jurisdictions, and governmental organizations. This would be refined during the outreach process and become an initial section of the subsequent watershed plan.

Step 2. Collect and Evaluate Data: This step builds on existing information and, with local guidance, allows development of a strategic monitoring plan to efficiently generate sound scientific information needed to support policy decisions for that particular area. Existing programs that monitor water quality have limited resources available to provide long-term detailed information on every waterbody in the state. Moreover, detailed monitoring and assessment for every watercourse would be prohibitively expensive and would not necessarily guarantee the appropriate information for guiding wise policy and decision-making.

Although based on limited information, existing water quality assessments, such as the State Water Quality Assessment, provide an excellent way to identify problem areas that require further attention. Furthermore, evaluation of strategic watershed monitoring data will reveal whether or not earlier information is sound and can be used to determine if a problem requires immediate attention. A preliminary assessment report will be the mechanism for communicating with stakeholders regarding goals and objectives and will provide a basis for priority-setting.

Step 3. List and Target Concerns: On the basis of the results from Step 2, concerns regarding water quality can be compared. A local advisory group might lead this effort. The level to which these concerns should be ranked will vary, according to the needs of the individual watershed. Rather than establishing a strict "priority list," the whole slate of concerns may be examined together. At the same time, resources available to address water quality management should be compiled. This means identifying potential funding sources and amounts and clarifying conditions for use of program loans, grants, and other funds that are available to address water quality issues. In this manner, a complementary suite of issues can be targeted for further action with identified sources of funding. This will ensure that the watershed plan can be implemented.

Step 4. Develop Management Strategy and Measures of Success: In this step, the watershed is considered as a whole and an overall strategy is developed to address targeted concerns in a rational, holistic manner. Indicators will be identified to measure how well each component of the strategy improves or protects water quality once implemented.

Step 5. Compile the Watershed Plan: Results of the previous steps are documented in a plan which is ideally consensus-based. Budgeting and assignments can be accomplished through agreements and commitments of involved parties to address specific concerns.

If there are issues that can be resolved at a later date without significant impact on the environment, or if there are long-term issues that cannot be resolved in a current management cycle, these can be identified for action in subsequent management cycles. If pressing needs cannot be addressed with currently available resources, local stakeholders who have been involved in identifying those needs could petition their elected representatives for allocations to address them.

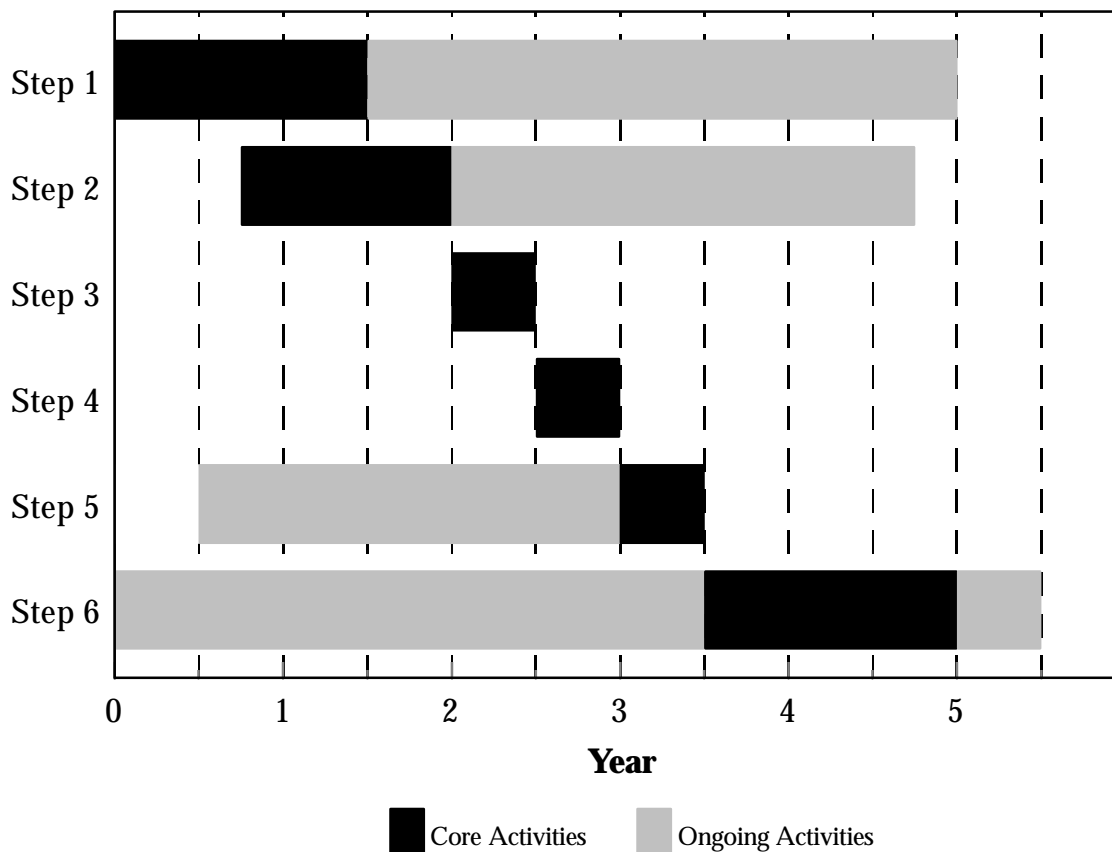
Step 6. Implement and Evaluate the Watershed Plan: Activities and strategies specified in the watershed plan are implemented in this step, along with evaluating their success to support continued progress in subsequent watershed planning cycles. Watershed plans will include a detailed schedule and description of management actions, resource commitments, memoranda of agreement, and other information necessary to track implementation.

2.2.2 Statewide Sequence of Watersheds

Because they cannot begin implementation in all watersheds simultaneously, ADEQ has developed a sequence for bringing watersheds online. The statewide sequence is a necessary tool that enables ADEQ to manage workload and resource demands. For example, the sequence staggers the use of strategic monitoring resources, which allows for increased spatial and temporal density of sampling within scheduled watersheds. Additionally, the sequence enables local, state, and federal watershed partners to anticipate opportunities for coordination and collaboration.

The statewide sequence was developed as a logical progression for implementing the statewide watershed approach and does not represent a prioritization. After the first statewide cycle is completed, each watershed will have its own iterative cycle. Existing activities and responsibilities will not be dropped to accommodate the cycle. Rather, as the sequence comes to a particular geographic area, ADEQ's activities will coordinate with the cycle. The sequence proposed by ADEQ for addressing the watershed management zones is illustrated in Figure 2-4.

Figure 2-4. Schedule for implementing Arizona's watershed approach



2.2.3 Specific Activities Within Watersheds and Subwatersheds

It is not the purpose of the watershed planning and implementation steps or the statewide sequence to dictate when activities can occur. It is inevitable and positive that certain management activities can proceed before all the watershed steps have been completed. However, it is important that these activities be reported to all watershed partners through whatever communication mechanisms (e.g, newsletters, watershed plans, electronic clearinghouse web page) the stakeholder groups have adopted. A detailed calendar of past, current, and planned activities maintains a connection between the watershed framework and activities that are occurring outside the framework. For example, all information necessary for a particular permit may be available. An agency should not delay the issuance of that permit simply to be consistent with the watershed steps. The information regarding that permit should be reported because it will be important at some point in the watershed cycle.

2.3 STAKEHOLDER INVOLVEMENT: FORMING WATERSHED PARTNERSHIPS

ADEQ is not exclusively nor entirely responsible for managing water resources. A key objective of ADEQ's watershed approach is to form effective partnerships among stakeholders. Stakeholders are defined as anyone having a stake in the watershed management process. This definition includes those who are affected by water quality problems, those whose activities will be affected by management and regulatory actions, and those who are responsible for managing water resources. The term *stakeholder* can cover a broad range of people and organizations:

- ◆ **Public:** Individual citizens, schools and universities, and interest groups (including citizen, environmental, consumer, and community groups).
- ◆ **Business:** Commercial and industrial firms, utilities, business groups, and trade associations.
- ◆ **Agriculture:** Corporate and individual farmers and ranchers.
- ◆ **Government:** City, county, regional, state, federal, and international governmental agencies, including ADEQ.
- ◆ **Tribal Governments**

The watershed management approach enables citizen and business participation by creating the capability to work directly with agencies and programs to provide services that lead to desired environmental results. An important reason for moving to a watershed management approach is to instill a more collaborative environment between ADEQ and stakeholders. This section describes how stakeholder involvement meets this objective.

Stakeholders play a vital role in providing stewardship for watershed resources. Stakeholder participation is necessary in order to have a clear understanding of existing values, interests, and goals regarding watershed resources. Stakeholders can provide invaluable input by identifying water quality priorities and viable implementation strategies to participating agencies. Many management strategies for restoring or preserving water quality will be ineffective unless they have stakeholder support and involvement. ADEQ has designed the framework to improve opportunities for stakeholder involvement. These opportunities also allow for participating agencies to communicate their decisions and needs.

Participation in the watershed protection approach is open to any interested stakeholder. The approach relies on voluntary participation and anyone with an interest in water quality management is encouraged to participate.

All water programs within ADEQ will participate and other agency stakeholders are likely to participate. Existing watershed work groups will continue to have the lead coordination role. Where there is an existing watershed team, ADEQ water programs will work with stakeholders to identify desired areas of support.

Steps in the watershed management cycle, which were described in Section 2.2.1, provide specific opportunities for stakeholder involvement.

- ◆ **Step 1:** Stakeholders help to formulate the goals and objectives for the watershed (e.g., for drinking water, recreation, and agriculture) and collect existing information on the watershed.
- ◆ **Step 2:** Stakeholders have the opportunity to assist in addressing information needs associated with the goals and objectives identified in Step 1 (e.g., volunteer monitoring). Stakeholders also review assessments based on collected information, including strategic monitoring results.
- ◆ **Step 3:** Stakeholders participate in negotiations to identify water quality concerns and issues that will be targeted for further consideration.
- ◆ **Step 4:** Stakeholders provide input to the development of the watershed plan and management strategies for targeted water quality concerns and issues.
- ◆ **Step 5:** Stakeholders review and comment on the compiled watershed plan. Stakeholders determine whether the watershed plan is consistent with the results of the planning process.
- ◆ **Step 6:** Stakeholders assume implementation responsibility for those components of the watershed plan that call for their involvement.

To date there are three major existing mechanisms for stakeholder involvement: (1) watershed advisory committees; (2) watershed stakeholder meetings; and (3) review and response to written status reports. The watershed approach offers two additional mechanisms for stakeholder involvement. First, ADEQ is evaluating the potential for developing information clearinghouses that support information management and communication for each watershed. For example, the clearinghouse could sponsor an Internet home page that would provide access to relevant watershed information. Second, community profiles offer a mechanism for soliciting views on watershed issues and values from a broad cross-section of the public. They provide a wealth of sociocultural data that can be used at each step in the watershed management cycle.

The watershed approach will also rely on public meetings and workshops throughout the watershed management cycle. These meetings will be separate from the formal hearings associated with ADEQ regulatory activities. Logistics for public meetings are the responsibility of the sponsoring organization within the watershed. Public meetings and workshops that are separate from formal hearings are designed for negotiations and education associated with watershed management objectives, and are in addition to regularly scheduled watershed advisory committee meetings.

The following functional roles have been identified for the watershed management approach. The specific agency or individual that fulfills these roles may be different in each watershed. Initial outreach efforts within each watershed will identify individuals and entities to fulfill each role.

- ◆ **Stakeholder:** Stakeholders include those who are affected by water quality problems, those whose activities will be affected by management and regulatory actions, and those who are responsible for managing natural resources in the watershed.
- ◆ **Sponsor:** The sponsor is the agency/organization taking the lead in the watershed (e.g., in coordinating stakeholder meetings and compiling watershed reports). Potential sponsors include citizen organizations, tribal organizations, and agencies of local, state, and federal governments.
- ◆ **Partners:** Partners are agencies and organizations that have agreed to participate using the schedule established for the watershed cycle. They also contribute to the development and implementation of the watershed plan. Partners support the watershed advisory committee and negotiate with other stakeholders to identify complementary objectives and areas for collaboration.
- ◆ **Advisory Groups:** Each watershed has an advisory group that is composed of stakeholders, sponsors, and partners. The advisory groups will serve as the focal point for planning and implementation activities. An existing watershed organization can be designated an advisory group if it is deemed to fairly represent the multiple interest groups in the watershed.
- ◆ **The ADEQ Watershed Team:** Each watershed advisory group will have a support team within ADEQ. ADEQ team members will support ADEQ project objectives identified by the watershed advisory committee and assigned by ADEQ section managers. An ADEQ watershed team member may be assigned to more than one team.
- ◆ **ADEQ Watershed Team Leader:** The ADEQ watershed team leader is a member of the watershed advisory committee and serves as the primary liaison between ADEQ and the advisory committee. The team leader represents ADEQ's interests on the advisory committee and communicates the committee's needs to ADEQ.

- ◆ **ADEQ Statewide Watershed Coordinator:** The ADEQ statewide watershed coordinator will compile the watershed priorities. The compiled list will be evaluated by section managers on ADEQ's Watershed Round Table for staff assignments and resource allocations. The statewide coordinator will track the statewide schedule and ensure communication among watershed teams.

2.4 ORGANIZATIONAL STRUCTURE

The long-term success of Arizona's watershed approach depends on coordination among government and private agencies and organizations, private citizens, and other stakeholders. Successful implementation of the watershed plan relies on broad participation. This section describes the coordination network that ADEQ will use at the state, federal, regional, and local levels. It also makes specific recommendations for organizing and integrating the efforts of stakeholders, sponsors, and partners within the statewide watershed framework.

The goal of the proposed coordination network is to establish a direct link between stakeholders represented by the watershed advisory committee and ADEQ section managers (Figure 2-5). Each organizational component described below facilitates the translation of watershed needs into accountable commitments within ADEQ--a process that enables ADEQ section managers to make sound decisions regarding the allocation of scarce resources and, in many cases, to negotiate agreements with watershed partners to identify potential areas for collaboration. Essentially, the process allows section managers to maintain control over their individual programs while still providing a mechanism for joint decision-making.

The supporting organizational structure for the watershed framework does not require the addition of any new positions to any government agency. Rather, the approach allows agencies to maintain their existing organizational structures while promoting improved coordination with other agencies and the public. Moreover, the organizational components described in this section may be adapted by watershed project teams to meet regional needs.

Individuals or organizations can participate in the watershed approach as stakeholders, sponsors, or partners. Stakeholder activities will be coordinated at three levels (Figure 2-6):

- ◆ Within *local subwatersheds* to rally public support and participation of local stakeholders to establish specific watershed management action plans to protect water quality that incorporate nonregulatory means with regulatory actions;

- ◆ At the *watershed* level for assessing water quality conditions within the watershed and establishing management goals and priorities specific to the region; and,
- ◆ *Statewide* for agencies and organizations that conduct watershed management activities across the entire state, and, therefore, need a statewide structure for targeting and synchronizing efforts with one another.

In order to effectively coordinate stakeholder activities at the statewide, watershed, and project levels, the ADEQ watershed framework will rely on six separate entities. Each entity may operate at more than one level. They are described below.

Figure 2-5. Integrated Management Network, Common Goals and Participating Stakeholders: The Verde River Watershed Management Zone Example

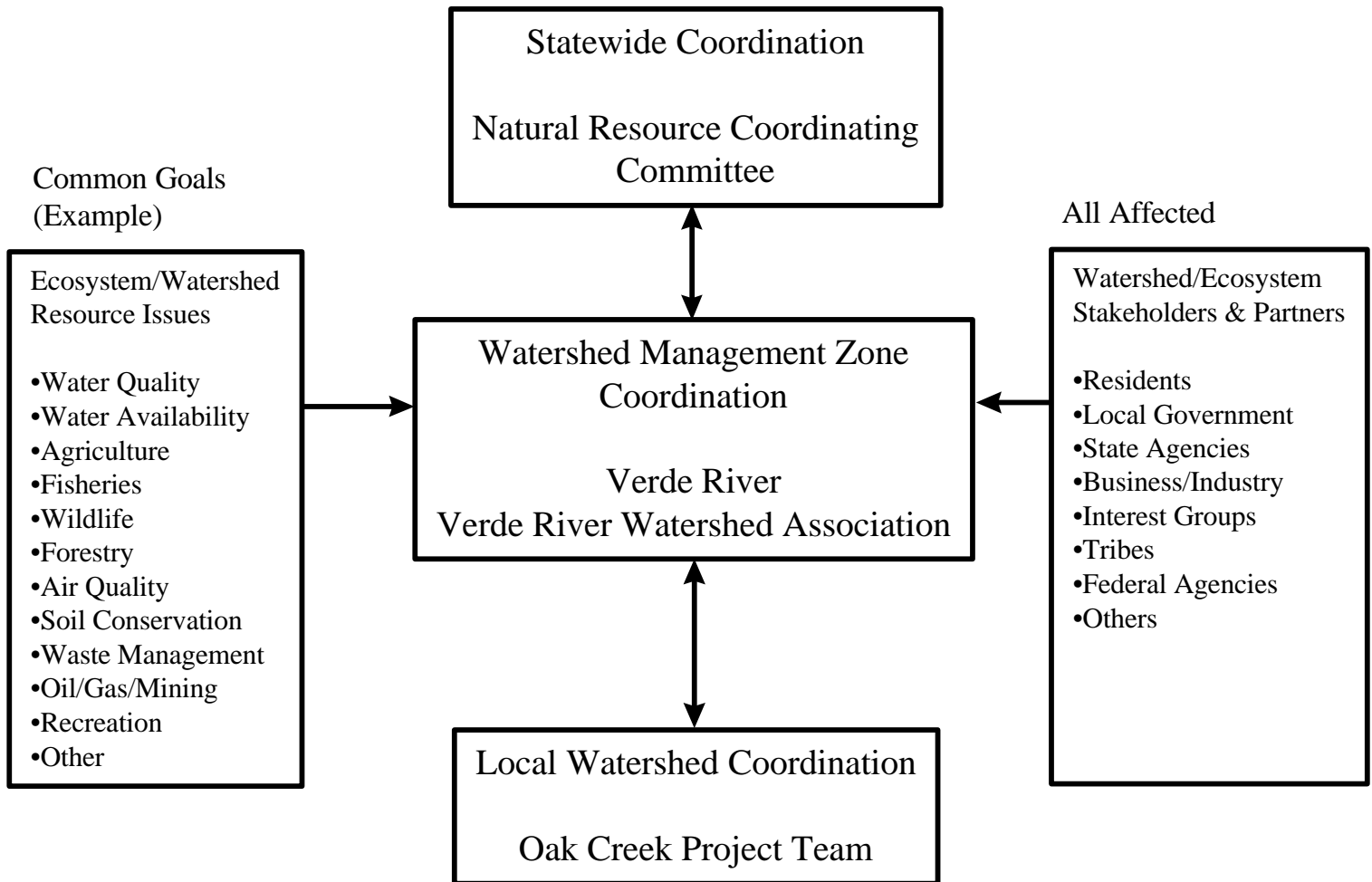
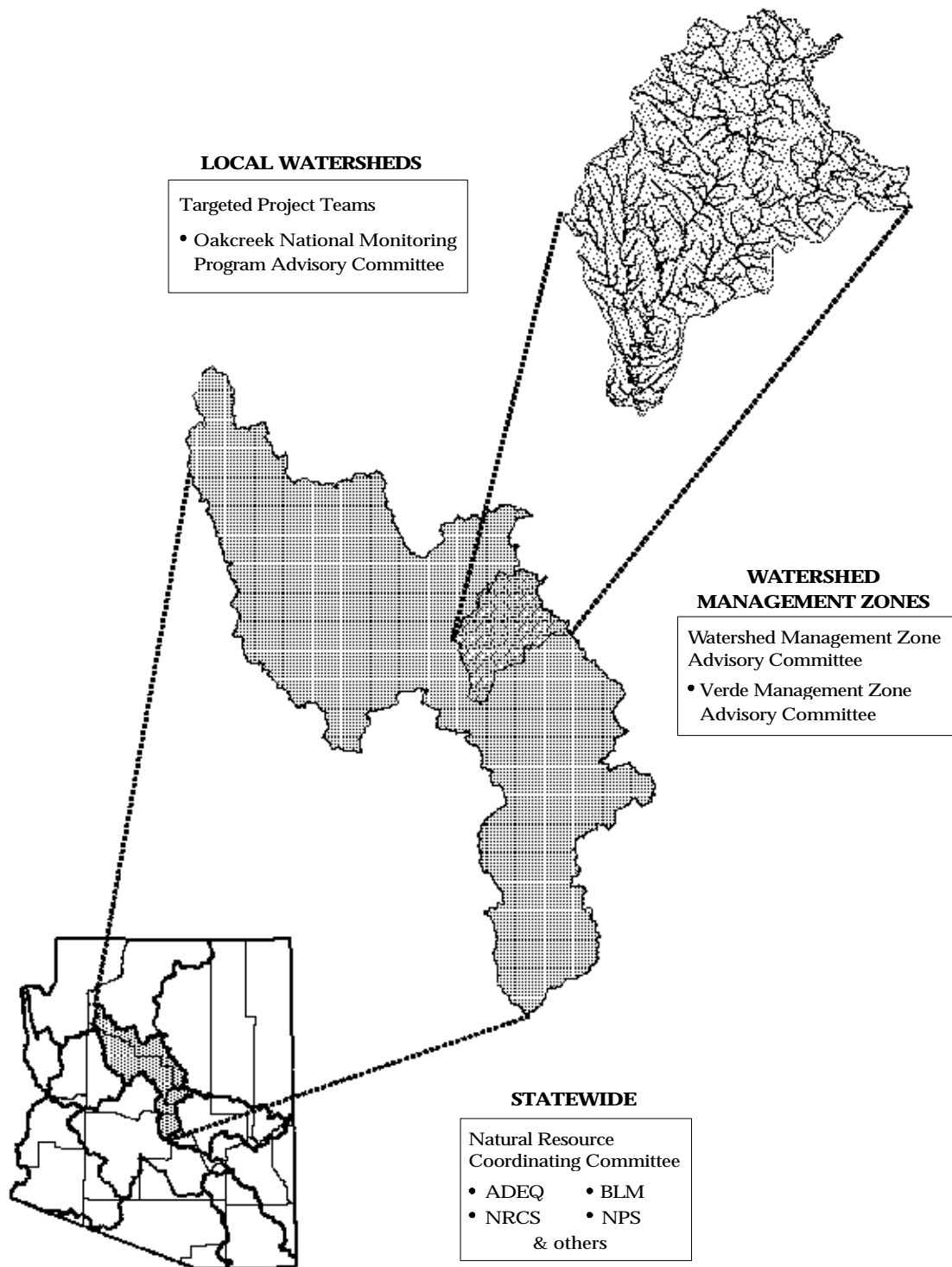


Figure 2-6. Stakeholder activities will be coordinated at three levels



2.4.1 Natural Resource Coordinating Committee

The Natural Resource Coordinating Committee is an existing interagency body comprised of members from many key statewide agencies with responsibility for natural resources management. The committee's mission is to promote cooperation to improve natural resource management in Arizona watersheds using an ecosystem approach. The Natural Resource Coordinating Committee provides a forum for communication among participating agencies that can be further expanded to meet the increased need for communication within the watershed approach.

The committee is uniquely positioned to recommend the most effective and equitable distribution of partner roles across watersheds. The Natural Resource Coordinating Committee could also provide a forum to develop perspective on the relative levels of commitment in each watershed.

2.4.2 Watershed Advisory Committees

A watershed advisory committee will be established for each delineated watershed. These committees will be composed of stakeholders, sponsors, and partners and will play a central role in the watershed approach (Figure 2-7). The committees will serve as the focal point for planning and implementation activities. Where possible, existing watershed organizations will be designated as the watershed advisory committee. A statewide agency (e.g., ADEQ) will serve as a catalyst only when necessary until a local organization can be recruited or developed to assume leadership within the committee. A sponsor will provide logistical support to the committee. The role of sponsor can be assigned to any of the core partners, depending on the specific issues to be addressed in each watershed.

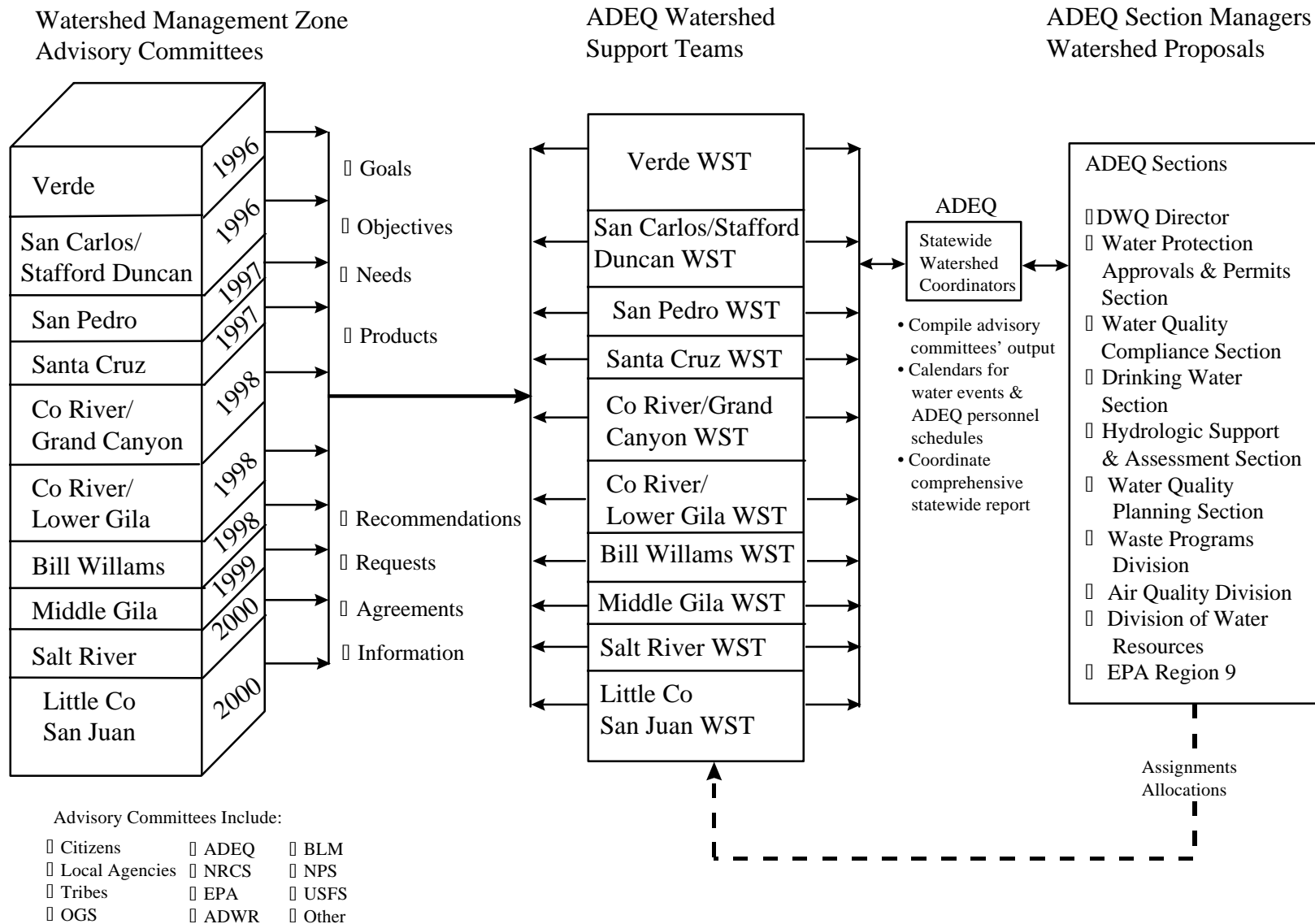
The goal of the watershed advisory committee is to develop and implement a watershed plan using the six-step approach described in Section 2.2.1. Committees can tailor the six steps to better serve the specific objectives of the committee's constituency. ADEQ's watershed schedule will be revised where existing watershed organizations have already completed steps in the cycle.

The watershed advisory committee makes recommendations on watershed goals and objectives. These recommendations are not binding to participating partner agencies. ADEQ has, however, adopted procedures to link committee recommendations to the ADEQ Water Quality Division's internal decision-making process (see Figure 2-8).

Figure 2-7. Watershed Advisory Committee Participants

POTENTIAL AGENCY PARTICIPANTS ON A WATERSHED ADVISORY COMMITTEE	
STATE	
	Arizona Association of Conservation Districts
	Arizona Department of Environmental Quality
	Arizona Department of Water Resources
	Arizona Department of Agriculture
	Arizona Game and Fish Department
	Arizona Geological Society
	Arizona State Land Department
FEDERAL	
	U.S. Army Corps of Engineers
	U.S. Bureau of Reclamation
	U.S. Bureau of Land Management
	U.S. Environmental Protection Agency
	U.S. Fish and Wildlife
	U.S. Forest Service
	U.S. Geological Survey
	USDA Natural Resource Conservation Service
OTHER	
	Flood Control District of Maricopa County
	Salt River Project
	University of Arizona

Figure 2-8. Direct link between the goals and objectives of stakeholders on the watershed advisory committee to the assignments and allocations made by ADEQ section managers.



Each watershed advisory committee has the discretion to develop its own rules of operation. Each committee will determine the voting status of participating partner agencies that come to the table to represent their interests in watershed negotiations. For example, ADEQ cannot abide a vote of the watershed advisory committee to disregard a water quality standard. Alternatively, the committee could determine the need for a site-specific standard as a primary watershed concern. ADEQ would then determine if sufficient resources were available for the necessary studies.

The watershed advisory committee is responsible for a large geographic area. There will often be occasions where the committee identifies and targets concerns in subwatersheds that are nested within the larger watershed. It may be impractical or inefficient for the entire committee to be involved in targeted local watershed projects.

The advisory committee will assist with recruitment of a support team for targeted local watersheds that include, at a minimum, local representatives.

2.4.3 Watershed Project Teams

Watershed project teams are a subset, or an extension, of the watershed advisory committee and may include staff from statewide agencies and local agencies. Teams are formed after the targeting process (Step 4 in the watershed cycle) is complete and are focused on tasks that require direct implementation and close collaboration with residents and landowners, especially nonpoint source projects. Teams will ensure representation of residents and landowners in the watershed approach. For example, they would work with landowners to find viable means of implementing more sustainable agricultural practices.

Selecting targeting criteria that address the likelihood of success, stakeholder support, and available funds will help ensure a high level of local involvement. The number of watershed project teams would, out of necessity, be limited by resources available to support them. The watershed advisory committee therefore plays an important role in identifying primary areas of water quality concerns.

2.4.4 ADEQ Watershed Support Teams

ADEQ watershed support teams will be established for each watershed advisory committee. The purpose of these teams is to provide coordinated support to each committee in meeting their project objectives. Watershed support teams will work closely with local, state, and federal agencies and tribal organizations to achieve a common approach to water quality management.

The ADEQ watershed support team leader will regularly attend watershed advisory committee meetings; other team members will attend when necessary. The team leader will represent ADEQ's interests in watershed advisory committee meetings and public meetings. Communication and negotiation skills are therefore important prerequisites for the team leader position.

The watershed advisory committee objectives and needs will be conveyed to the ADEQ Section Managers Watershed Round Table (described below). Section managers evaluate advisory committee concerns and requests in the determination of ADEQ watershed team assignments and allocations. Work plans for individuals will be based on tasks and assignments directed to each ADEQ watershed support team, and staff performance evaluations will consider progress made on ADEQ watershed team assignments.

2.4.5 ADEQ Statewide Watershed Coordinator

The ADEQ statewide watershed coordinator—the central point of information from the ten watershed support teams—directs information, requests, and recommendations to the ADEQ Section Managers Watershed Round Table. Team leaders compile project objectives and needs for their watershed advisory committee on a regular basis (e.g., every six months). Advisory committee requests will reflect where their watershed is in the management cycle. Additionally, committee needs assessment reports will likely include requests for contingencies that are not related to a particular watershed cycle step. The statewide watershed coordinator gathers information for all watersheds for use by the ADEQ Section Managers Round Table for workload and resource planning for the watershed approach.

The ADEQ statewide watershed coordinator will also promote communication among ADEQ watershed teams through regular meetings with team leaders. The ADEQ statewide watershed coordinator will track progress for all watersheds and help team leaders identify problems and solutions. The coordinator will serve as a liaison between the ADEQ watershed team leaders and the ADEQ section managers.

2.4.6 ADEQ Section Managers Watershed Round Table

Aligning the numerous ADEQ programs that impact water quality is key to the success of the watershed approach. The section managers within the Water Quality Division will form a Round Table to provide management support and direction to ADEQ watershed support teams. Round Table membership may include the statewide watershed coordinator, Water Quality Division section managers, a representative from the other ADEQ divisions, and possibly a representative from the U.S. Environmental Protection Agency.

Responsibilities of the ADEQ Section Managers Watershed Round Table include:

- ◆ Directing division resources to accomplish watershed-based management in a unified manner,
- ◆ Projecting staff and budget needs to accommodate simultaneous activities within a particular watershed and sequential activities across watersheds statewide,
- ◆ Briefing internal management and staff on a quarterly basis on each watershed within the sequence,
- ◆ Identifying cross-media (that is, water, soil, and air) and cross-agency issues that need to be addressed in the watershed framework,
- ◆ Providing policy leadership to adjust departmental procedures to accommodate watershed-based management activities,
- ◆ Guiding transition of statewide efforts to the watershed approach, and
- ◆ Briefing ADEQ senior management.

2.5 WATERSHED PLANS: WRITTEN AGREEMENTS

The final structural element of the watershed approach, the watershed plan, is a common product for participating programs and other stakeholders that promotes coordination among participants. Watershed plans consolidate information regarding water quality management into a format that is useful to a broad range of audiences. ADEQ will use watershed plans to promote stewardship of water resources across the state.

2.5.1 Purpose and Audience for Watershed Plans

Watershed plans document the consensus-based process that identifies and prioritizes water quality problems and develops management strategies to address them. Plans guide agency partners and other stakeholders in implementing resource protection activities, and are a reference for future iterations of the watershed management cycle. One purpose of the document is to foster stewardship among all stakeholders; thus, watershed plans must address the needs of each stakeholder.

The overall goal of watershed plans is to provide the following benefits to all stakeholders:

- ◆ Promote understanding of management activities for specific waterbodies and regions; and,
- ◆ Consolidate information and fulfill reporting requirements for several programs and agencies into one central document.

Plans can be used to fulfill requirements of state and federal environmental legislation. For stakeholders such as county commissions, the document serves as a reference for land-use planning and guides effective local resource protection efforts and management programs (e.g., determining location of open space and requirements for stormwater control and wastewater utilities). Investors and private dischargers can use the plans to identify critical habitat areas to guide their land purchases. Private dischargers will know in advance the status of available assimilative capacity and the type and level of treatment technologies required of existing dischargers in the area. The general public will have an enhanced understanding of their immediate environment, and they will see the results of their input into the planning process for ensuring a sustainable future for local water resources.

ADEQ will focus on coordinating and implementing watershed plans to achieve environmental objectives as efficiently and effectively as possible. Below are descriptions of several potential audiences and how watershed plans could address their particular needs.

General Public: Watershed plans are designed to fulfill ADEQ's objective of effective communication to the general public regarding the status of water quality and ADEQ's actions to address water quality problems. The plans will convey a comprehensive assessment and management strategy, rather than individual program activities.

Watershed Stakeholder Groups: The watershed plan will compile activities, findings, and agreements of watershed teams and stakeholder groups. The plan ensures that management activities are consistent with the consensus reached during plan development. Watershed teams and stakeholder groups can also use the plan in successive iterations of the planning cycle to identify information gaps and priorities that could not be addressed earlier due to resource limitations. The plans also document specific environmental objectives that committees can use to measure the effectiveness of the management actions they adopted.

Other Coordinating Committees: Existing statewide organizations could coordinate resource agency activities. The framework is strictly voluntary and participants retain authority over their own funding and mandates. Watershed plans could, however, provide a valuable focal point for these groups to coordinate their water quality activities. ADEQ invites input from statewide committees and councils on plan development. Additionally, these plans will provide valuable information to these committees regarding water resources management.

Statewide Watershed Teams: Watershed plans will be used for guiding and coordinating program activities within ADEQ. The plans will provide the basis for developing and submitting grants, staff workload planning, allocating budget resources, and performing individual and agency performance reviews. Not all of ADEQ's resources will be committed to the watershed management approach. Watershed plans can be used, however, as both an internal and external record of commitment of agency resources and activities.

County Commissions and Municipal Agencies: Representatives of county commissions and city agencies should be recruited to the watershed advisory committees, creating opportunities for these entities to have input into plan development. Input of local representatives is a vital component of tailoring the plan to watershed needs. County commissions and other local agencies can use the plans for developing local implementation plans for public wastewater treatment works, stormwater, parks and open-space planning, zoning, water resource planning, and other activities.

Arizona State Legislature: Watershed plans will contribute to improved communication between ADEQ and the legislature. The Arizona state legislature will find watershed plans useful for estimating budget needs for ADEQ water quality programs and tracking funds that have been allocated to the agency. Individual legislators can use the plans to track the water quality activities of ADEQ in their districts. For example, when a citizen calls with a specific complaint or request, the plan will provide points of contact on watershed advisory committees, describe the status and priority of the waterbody of concern, and indicate the next available opportunity to provide input into the planning process.

Regulated Community: The regulated community will have a comprehensive guide to all identified water quality concerns, the levels and types of controls that are recommended in the watershed, and the status of the remaining assimilative capacity and other resources of concern (e.g., wetlands and endangered species). While the watershed advisory committee provides a consolidated point of contact regarding regulatory issues, the plan provides a single comprehensive guide to requirements and opportunities related to water quality.

U.S. Environmental Protection Agency Region 9: Watershed plans will help eliminate redundancy in reporting by consolidating many topics within a single document. Several program requirements can potentially be met through the plans, including compliance with Clean Water Act §303(e) [TMDL development], §305(b) [Statewide Status and Trends], §319 [Nonpoint Source], and §314 [Clean Lake grant requests and project implementation reports], Triennial Standards update, §401 and §404 certifications, and stormwater plans. Essentially, watershed plans become ADEQ's mechanism for accounting to EPA Region 9 on issues of water quality. ADEQ will develop an explicit agreement with EPA Region 9 further defining the requirements that watershed plans must meet to serve this function. The watershed plans will provide a more comprehensive basis to apply for EPA grants to fund water quality activities [e.g., §104(b)(3), §106, §314, and §319].

State and Federal Agencies: Watershed plans will provide other state and federal agencies ready access to key information related to water quality that was formerly scattered. For example, watershed plans will provide the U.S. Fish and Wildlife Service with comprehensive information on the status of water quality in a region where endangered species are located. The plan will also provide information on how ADEQ will continue to protect or mitigate water quality conditions that will meet Endangered Species Act requirements. Previously, this would have required a special agreement between the agencies and a special project status.

2.5.2 Watershed Plans: Content and Format

Watershed plans provide critical direction and reference for the overall watershed management approach. Watershed plans document water quality conditions, trends in basin development, management priorities and goals, and management strategies to achieve those goals. Plans will be updated every five years to make them better long-term references for planning and determining regulatory requirements. Figure 2-9 is a sample outline for a watershed plan, and below is a more detailed description on the kind of information to be included in each section.

Executive Summary: The executive summary will be a condensed version of the watershed plan and will include major findings and management recommendations. Activities crucial to successful plan implementation will be highlighted, along with steps critical to future planning efforts.

Figure 2-9. Watershed Plan Outline.

WATERSHED PLAN OUTLINE	
Chapter 1	Introduction
1.1	ADEQ Description and Mission Statement
1.2	Purpose of the Plan, Planning Process, and Stakeholder Role
1.3	Historical/future Management Efforts
Chapter 2	General Description of the Watershed Management Zone
2.1	Physical, Geographic, Hydrologic, Ecological Features
2.2	Governmental Organization and Population Demographics
2.3	Economic Base
2.4	Land Use/Land Cover
2.5	Stakeholder Characterization
2.6	Water Use Designations and Corresponding Standards
2.7	Pollutant Sources
Chapter 3	Existing Watershed Conditions: Assessment of Environmental Data
3.1	Relationship Between Surface Water and Groundwater
3.2	Surface Water
3.3	Groundwater
3.4	Other Media
Chapter 4	Priority Concerns and Targeted Environmental Objectives
4.1	Resource Limitations
4.2	Criteria for Prioritization of Resource Allocations
4.3	Prioritized Concerns
4.4	Targeting Priority Concerns
Chapter 5	Problem Quantification
Chapter 6	Management Goals and Strategy
Chapter 7	Recommended Water Quality Actions
Chapter 8	Future Considerations

Chapter 1. Introduction: Chapter 1 will provide a historical perspective on past management efforts, the vision and rationale of future plans, a brief description of ADEQ's watershed management approach, and a clear statement of the purpose of the watershed. This chapter will describe the role of watershed advisory committees and other stakeholder input to the development of the plan. It will indicate ADEQ's role in environmental management, and provide a guide for using the document.

Chapter 2. General Description of the Watershed management zone: This chapter characterizes the watershed through a combination of narrative descriptions, tables, maps, and other types of graphics that cover a wide range of features such as geology, hydrology, land uses, demographics, economic bases, and watershed development trends. Water use designations and general descriptions of major pollutant sources will also be included. Chapter 2 will provide the reader with a thorough foundation for understanding factors critical to water quality assessment and management.

Chapter 3. Existing Watershed Conditions and Assessment of Environmental Data: Chapter 3 will describe the current and historical condition of surface water and ground water within the watershed. After a brief discussion of the relationship between surface water and ground water quality, it will provide information on data sources, methods of data interpretation, and assessment results for each resource. In addition to providing use support status summaries, the chapter will discuss the implications of data coverage. It will identify critical issues addressing both protection and restoration objectives, along with data gaps and deficiencies that should be addressed by future monitoring efforts.

Chapter 4. Priority Concerns and Targeted Environmental Objectives: This chapter will show how stakeholders assigned priorities to restoration and protection objectives identified in Chapter 3. ADEQ will describe their ranking of critical issues and waterbodies of concern if they are inconsistent with the general stakeholder consensus. Chapter 4 will also address the issue of how priority concerns were targeted for further consideration for management actions. The subset of priority issues that have been targeted for further action becomes the focus for the remainder of the document.

Chapter 5. Problem Quantification: Chapter 5 will summarize quantification analyses that are performed on waters targeted for implementation of management strategies during the current watershed management cycle. These analyses will reflect work needed to clarify the magnitude, causes, and sources of problems. Quantification includes estimates of assimilative capacity and existing source loads; establishing TMDL control strategies (i.e., required reductions); estimates on extent of habitat impairment; extent of hydrological modification (i.e., percent imperviousness; loss of wetlands; magnitude of diversions, withdrawals, return flows, and extent of ground water use); and population status of biological resources.

Chapter 6. Management Goals and Strategy: This chapter will discuss immediate and long-range goals for the entire watershed, along with the corresponding general management strategy to meet those goals. The advisory committees will determine the extent to which the targeted problems are interrelated and subject to an integrated management strategy. Existing management activities that are relevant to those goals will be covered in addition to new management initiatives that will be necessary to achieve environmental objectives.

Chapter 7. Recommended Water Quality Actions: Chapter 7 will present the individual management strategies for each waterbody segment of concern. Decisions, methods, and criteria used to establish management strategies will be documented. In addition to describing specific control strategies, the chapter will include recommendations for filling gaps in monitoring information and measuring the success of proposed strategies. Also, the implications of the strategies for stakeholders will be summarized.

Chapter 8. Future Considerations: This chapter will discuss potential future efforts for priority waters that are not currently addressed in the plan. This chapter can address the following reporting requirements:

- ◆ Annual ground water report (possibly statute limited)
- ◆ Annual Pesticides Report
- ◆ Annual Report to Legislatures
- ◆ Clean Lakes Program
- ◆ State budget request
- ◆ Environmental indicators
- ◆ EPA grant requests
- ◆ Special project grants
- ◆ Nonpoint source quarterly report
- ◆ §208 plans
- ◆ Report to the public
- ◆ Continued planning process
- ◆ TMDLs

The summary of requirements to be fulfilled will include a description of how the watershed plan will meet the obligations of each requirement.

SECTION 3

ACTIVITIES, TOOLS, PARTNERS AND EVALUATION

Section 3 describes how ADEQ will evaluate the health of watersheds, using the practices and procedures of the watershed approach. The purpose of this section is also to describe who should consider becoming a watershed partner and what their role might be. The nine elements of the watershed approach are depicted in Figure 1-3; geographic management units, stakeholder involvement, the watershed management cycle, and watershed plans are described in Section 2. The remaining five elements are addressed in this section.

3.0 PLAN ELEMENTS

- ◆ **Strategic Monitoring and Information Management:** The capability to use existing information for education is essential to building consensus among watershed partners. Knowing what is available allows ADEQ to focus on gathering information that fills in the data gaps and adds dimension to the key issues raised at stakeholder involvement and advisory committee meetings. By doing this early on in the watershed cycle, ADEQ will be able to preclude unnecessary activities and reinforce program areas that provide more support.
- ◆ **Watershed Assessment:** The goal of watershed assessment is for all stakeholders to understand the linkage between watershed processes, stressors, and water quality indicators. The foundation for building consensus among watershed partners is clear communication of all the information collected in the watershed. Incorporating the assessment throughout the watershed cycle will allow ADEQ to tailor their actions to real environmental conditions and problems within the watershed.
- ◆ **Water Quality Issue Identification, Priority Setting and Targeting:** The watershed approach includes explicit steps for assigning ADEQ's limited resources to achieve the best environmental results. The tools for making these decisions are flexible and inclusive.
- ◆ **Management Strategies:** Development and implementation of watershed management strategies lead to precise assignments to address targeted water quality objectives.
- ◆ **Implementation:** Implementation agreements lay the groundwork to revisit water quality concerns for reconsideration of assignments. Repeating the cycle provides flexibility for modifying and making new assignments. The general activity areas of the watershed framework provide the basis for coordinating the activities of a wide range of stakeholders.

3.1 STRATEGIC WATERSHED DATA COLLECTION AND MONITORING PLANS

ADEQ is making a substantial investment in acquiring and managing information on community needs and environmental conditions. Information from strategic watershed data collection and monitoring plans will provide an improved basis for decision-making by all stakeholders. This activity is an essential component of the watershed approach because of the emphasis on tailoring actions to actual environmental conditions. The alternative is to base management actions on generic program guidance. Maintaining current and comprehensive information on the watershed will reduce the incidence of generic compliance measures and promote stewardship in the watershed.

3.1.1 Uses of Environmental Information in the Watershed Approach

The existing physiographical, land use, facility, water quality, and ecosystem information for each watershed will be collected and interpreted to assess current environmental conditions within the watershed. ADEQ maintains some of this information now on stand-alone databases and GIS. Typical information ADEQ has gathered includes drinking water and wastewater systems, underground storage tanks, mining impoundments, and solid/hazardous/special waste storage, treatment and disposal facilities. Many facilities are geographically located by latitude and longitude or cadastral coordinate system.

The amounts and types of information available are likely to vary among watersheds, but may include data generated by:

- ◆ Ambient surface water and ground water quality monitoring programs conducted by ADEQ and other state, federal, and local governments, and private entities;
- ◆ Targeted surface water and ground water quality studies conducted by ADEQ and other state, federal, and local governments, and private entities;
- ◆ Biological surveys (benthic, algal, fish, and riparian) conducted by ADEQ and other state, federal, and local governments, universities, and private entities;
- ◆ Toxic contaminant studies (sediment, fish, avian, aquatic insect, and reptile tissue) conducted by ADEQ and other state and federal governments;
- ◆ Discharge, in-stream, and ground water quality monitoring programs as required by NPDES and aquifer protection permits;
- ◆ Water quality monitoring programs testing public drinking water supplies according to the Safe Drinking Water Act; and
- ◆ Pollution studies at potential and active state and federal Superfund cleanup sites.

3.1.2 Identifying Stakeholder Environmental Data Needs

During Step 1 (Stakeholder Outreach Information), the ADEQ watershed support teams will identify stakeholder water quality goals for the watershed and the information needs associated with those goals. Potential partners include citizens; tribal organizations; and local, state, and federal resource management agencies that can collaborate in the collection of targeted environmental data. This step has two primary objectives:

- ◆ Demonstrate to public and agency stakeholders that ADEQ is listening to their needs and
- ◆ Identify complementary information needs and objectives that can be built into the strategic environmental data collection plan.

The resources from ADEQ necessary to complete this step will change from one watershed to the next. ADEQ may be expected to provide the personnel to complete these tasks if another partner agency does not. This step may require staff to attend and facilitate stakeholder outreach meetings and translate meeting results into specific objectives to be incorporated into the environmental data collection plan. The ADEQ watershed support team will be responsible for ensuring that the environmental data collection plan accurately reflects the goals and objectives of the stakeholders.

3.1.3 Monitoring Plans

Strategic monitoring plans are key to the success of any watershed approach. Accurate data are needed for several purposes:

- ◆ Establishing designated use support status,
- ◆ Identifying water quality trends,
- ◆ Screening existing or emerging water quality problems,
- ◆ Locating and quantifying pollutant sources,
- ◆ Characterizing the extent of environmental contamination,
- ◆ Evaluating the effectiveness of management actions, and
- ◆ Calibrating models for use in defining and distributing a watershed's assimilative capacity (i.e., TMDL development).

A strategic monitoring plan coordinates activities within and across programs to meet objectives and ensure efficient use of resources. Under the proposed watershed sequence schedule, the strategic monitoring plan will be updated by October 1 of each year to coincide with the federal water year (October 1 through September 30). Each year's strategic plan will outline the proposed allocation of resources to various types of monitoring to support the watershed approach. For instance, a portion of the water year 1997 strategic plan will focus on assessment of the designated use status for the Upper Gila and Verde River watersheds. The remainder of the strategic monitoring plan will need to address special studies in prioritized waterbodies for problem quantification, model calibration, and measuring program success.

The strategic monitoring plan will also serve as the basis for coordinating monitoring with stakeholders outside of ADEQ who wish to play a role in the watershed approach. In-stream monitoring required of point source discharges through NPDES permit conditions, monitoring by other government agencies, or voluntary monitoring efforts by citizen or industrial groups can all be made more effective when objectives are established and resources allocated in ways that augment the watershed approach. ADEQ's monitoring programs have several facets:

- ◆ **Ambient Monitoring:** Regular, periodic sampling at strategically located sites to assess water quality, document trends, screen problems, and evaluate the effectiveness of large-scale management controls.
- ◆ **Compliance Monitoring:** The inspection and sampling of permitted wastewater treatment facilities to determine whether they are meeting the conditions of their permits and to provide data on pollutant loads and effluent toxicity. This also includes the inspection and sampling of public drinking water supplies to evaluate compliance with the Safe Drinking Water Act.
- ◆ **Targeted Surveys:** Water quality studies designed to evaluate the ecological significance of conventional and toxic pollutants or other stressors often used to locate and quantify pollutant sources, measure the effect and fate of pollutants, and characterize the extent of environmental contamination. These studies characterize and assess ecosystems and overall watershed health.

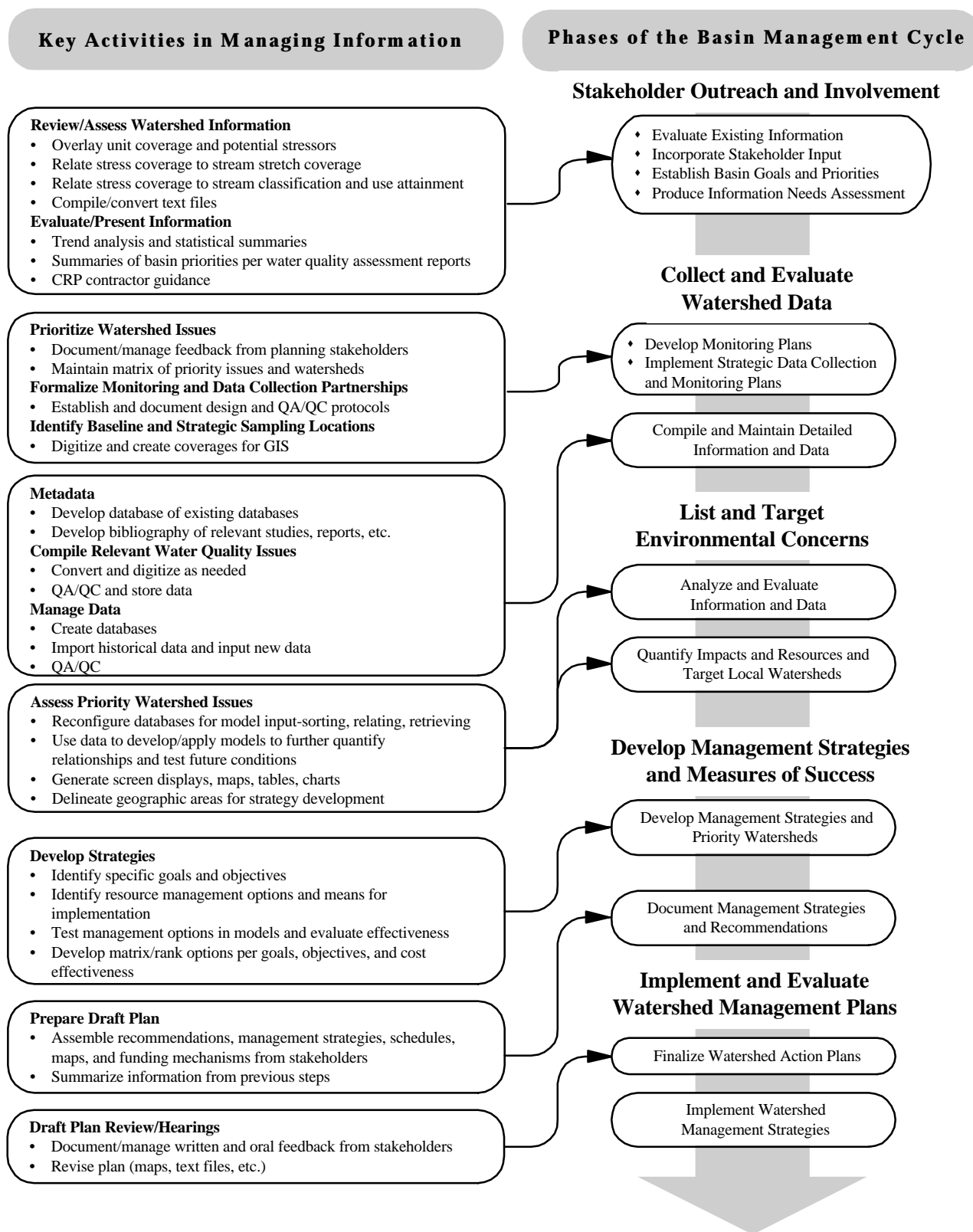
Monitoring studies that can be completed in time for the upcoming management plan development will be performed during the scheduled period for a given watershed. In certain cases, however, special studies may need to be performed outside their designated period. The strategic monitoring plan should therefore track monitoring priorities as they relate to the overall list of prioritized waterbodies. The strategic monitoring plan will be updated as appropriate to incorporate monitoring efforts outside ADEQ that are identified through outreach and stakeholder involvement. ADEQ favors efforts that pool resources among stakeholders, thereby providing more comprehensive monitoring of larger segments of the watershed.

3.1.4 Information Management

Throughout the watershed management cycle, information management plays an important role. Figure 3-1 summarizes information management activities associated with each step in the cycle. Although the activities listed in Figure 3-1 are not requirements in the watershed approach, they do represent the full range of information management and communication support activities that a watershed team should consider. An adequate data management system is essential to transform the environmental data collected into a comprehensive assessment that supports the planning process and builds stewardship among stakeholders.

Information collected for each watershed will ideally be managed by ADEQ on a relational database system that is linked to a geographic information system (GIS). The term GIS encompasses the entire field of computerized mapping. A GIS is a computerized database of information that is stored and retrieved based upon geographic location. The databases may be stored on a user's computer or on a network server where they can be widely accessed by stakeholders. The GIS component will play an important role in assessing current watershed conditions and generating data maps for use during the public outreach process. This system is not yet in place but needs to be at least partially functional before the data collection phase begins for the first two watersheds.

Figure 3-1. Information management activities associated with management cycle steps



ADEQ currently maintains a GIS with coverages for land use, land ownership, surface water hydrography and watersheds, ground water active management areas, physiographic regions, ecoregions, natural vegetation types, precipitation, geology, political jurisdictions, and incorporated areas. The U.S. Geological Survey (USGS) maintains a GIS with coverages for Arizona ground water basins, topography, and numerous other fields that may be obtained and used for the watershed database. The Arizona State Land Department and the University of Arizona also maintain a number of GIS coverages that are available for use.

Currently, ADEQ water quality and ecosystem data are maintained on a combination of relational databases, spreadsheets, and in paper files. Most federal agencies maintain their data on a mainframe database. Some state agencies maintain their data on a database while others do not. How the local agencies and private entities manage their data still needs to be determined. Data that are important to the initial watershed assessment but are not maintained on a database will need to be entered into the watershed database.

3.1.5 AZURITE Database Management System

ADEQ is taking steps to improve information management for agency operations. AZURITE, a department-wide database management system is being developed by the ADEQ Information Systems Development Office (ISDO). Currently, there are over 250 nonconnected, nonintegrated information systems within ADEQ alone. Although these individual databases may adequately serve the needs of their respective programs, their isolation from each other prevents a comprehensive understanding of the interrelated character of real places and communities. The AZURITE strategy is to:

- ◆ Establish principal databases of key information required to connect program-specific or cross-program databases. For example, the principal databases will contain "place" information: geographic areas, such as a county, national forest, or watershed; specific locations, such as industrial facility, wastewater treatment plant, surface water quality sampling location, or well location; and even the broader notion of a conceptual place, such as a regional utility with a number of sites.

- ◆ Link program-specific or cross-program auxiliary databases using the key data of “place” contained in the principal databases. Inquiry of a principal database will link to all auxiliary databases with information connected with that place. For example, if a watershed is selected as the place of interest, the AZURITE system will allow inquiries to a variety of databases containing information such as water quality sampling results, compliance histories of facilities within the area, drinking water sampling results, or areas of known ground water contamination. Critical to this effort is the reconfiguring of individual databases, as needed, to allow efficient access to data and establishing quality control/quality assurance maintenance procedures to ensure the value of the data contained within individual data sets.
- ◆ Integrate tabular data, such as water quality sampling results, with geographic information systems so that the power of graphic representation of an area can be augmented with specific information and combinations of information within the area. AZURITE systems will be designed to allow department staff and the public to readily answer basic questions of environmental concern within specific geographic areas. The AZURITE program is in the mid-stage of conceptual development, hence full implementation is still several years off. Support from the public and regulated community for AZURITE development has been documented in a legislative study committee, and if legislative appropriations are made available to better fund the AZURITE project, development of the integrated data management system at ADEQ could proceed more rapidly.

AZURITE will improve access to and use of existing surface and ground water databases maintained by ADEQ’s Division of Water Quality. These databases are described in greater detail in Chapter 4 as part of the description of participating ADEQ sections.

Additionally, ADEQ continues to refine their GIS capabilities. A complete GIS system can be used to perform a number of functions:

- ◆ Describe what exists at a specific location,
- ◆ Locate areas consistent with specified evaluation criteria,
- ◆ Illustrate environmental trends for multiple parameters,
- ◆ Identify landscape patterns, and
- ◆ Model various scenarios.

3.1.6 Other Watershed Information

The watershed approach will require consideration of information other than traditional water quality data. The watershed advisory committees and ADEQ watershed support teams will need to assess many aspects of the watershed to develop meaningful, comprehensive solutions. Until AZURITE is up and running, facility location and data will need to be collected from those ADEQ programs that currently maintain a facility database. Those facilities important to the initial watershed assessment but not maintained on a database will need to be entered into the watershed database.

3.1.7 Information Clearinghouses

The information management system should have the capability to receive geographically targeted environmental data from multiple sources and to be accessed for use by watershed approach partners. Clearinghouses provide a central point for collecting and distributing information essential to the watershed management process. They could be viewed as an electronic atlas for the watershed. Clearinghouses are being established in other watershed states (e.g., Washington and Alaska). Arizona's system can start as a simple collection point in the watershed for existing information and evolve as more data accumulates and the system becomes more sophisticated to handle it. An information clearinghouse would be a local or regional entity that is chartered by watershed partners. The watershed advisory committee can serve as its board for establishing policy and overseeing its operation.

The clearinghouse will have the capability to maintain an Internet home page that displays information regarding the watershed management process and receives input from users—a valuable function for those stakeholders who are unable to attend advisory committee or general meetings of the watershed management zone.

The information clearinghouse would not try to duplicate other existing databases that are maintained by other organizations (e.g., ADEQ). Rather, the clearinghouse would use meta-files that summarize or provide “pointers” to the large complex databases. The clearinghouse would compile the results of stakeholder meetings, strategic monitoring data, and other information developed over the course of watershed management cycles. This information will be used to compile the watershed plan.

Advisory committees and watershed teams could expect the system to provide several benefits, including improved quality of information, increased consistency through use of a common information base, and easier access to data in other programs. Also, improvements in the accuracy of environmental and location data will increase the reliability of assessment tools that rely on the information and, ultimately, result in better management decisions. Finally, the capability to derive an agency-wide schedule will greatly enhance day-to-day planning between agency components for implementing the watershed approach.

3.2 ASSESSMENT PROCEDURES AND ENDPOINTS

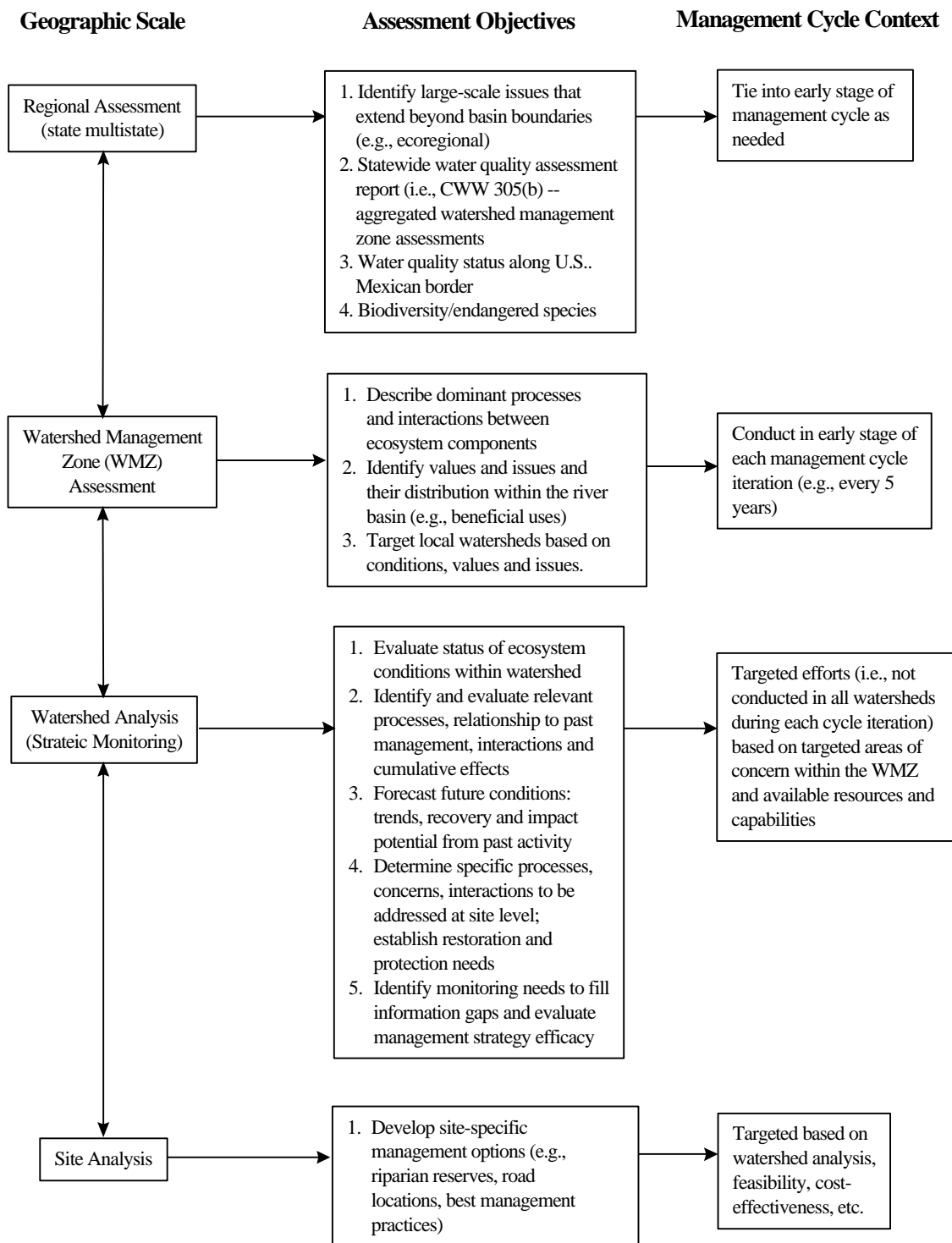
Watershed assessment is the characterization of the human, aquatic, riparian, and terrestrial features, conditions, processes, and interactions within a watershed. The watershed approach will pose significant challenges for conducting environmental assessments. Watershed support teams and stakeholders will recommend a diverse selection of environmental objectives and measures of success. The watershed advisory committees and partners will identify their goals and objectives for the watershed and the assessment will be tailored to these. There are several benefits of a watershed assessment:

- ♦ Enhanced ability to estimate direct, indirect, and cumulative effects of management activities;
- ♦ Guidance for general type, location, and sequence of appropriate management activities, including restoration within a watershed; and
- ♦ Analysis of ecosystems at watershed scale to support sustainability of natural systems and human activities.

The term watershed assessment is applied to many types of assessments that occur throughout a watershed management cycle. Figure 3-2 illustrates the changing nature of assessments over time and geographic scales in the watershed management cycle.

In the early stages of the cycle, assessment involves determining severity of water quality and ecosystem impairment and identifying sources and causes of impairment. Problem quantification, predictive water quality modeling, and other assessment procedures are used in the middle stages of the cycle in the establishment of TMDLs and management goals. In later phases of the cycle, assessment procedures can be used to evaluate the effectiveness of implemented management strategies.

Figure 3-2. The nature of assessments over time and geographic scales in the watershed management cycle.



Assessments developed as part of the statewide watershed management strategy will include information that fulfills many EPA reporting requirements, including Sections 303(d), 305(b), and 314(a) of the Clean Water Act. Reports will also make information readily accessible and easily comprehensible to the diverse stakeholders. Table 3-1 summarizes some program reporting requirements, assessment methods, frequency, and relationship to the watershed cycle for which ADEQ is responsible.

The process for conducting watershed assessments will be issue-driven and incremental. ADEQ will not have the resources to conduct full-scale watershed assessments. By using intensive studies and following an established process, however, watershed support teams can build on analyses over time.

The watershed assessment process has six steps:

1. Define current conditions
2. Describe reference conditions
3. Conduct a synthesis and interpretation of available data
4. Identify key issues and concerns
5. Prioritize key issues and concerns
6. Provide recommendations for targeting.

3.3 WATER QUALITY ISSUES: IDENTIFY AND TARGET

One of ADEQ's primary objectives in adopting the watershed approach is to improve the method for assigning ADEQ's limited resources to achieve the best environmental results. To this end, one step is the stakeholders' review of environmental data to identify key water quality concerns and to target the most effective use of department resources. Watershed advisory committees and watershed partners determine which tools to use in the identification, prioritization, and targeting process.

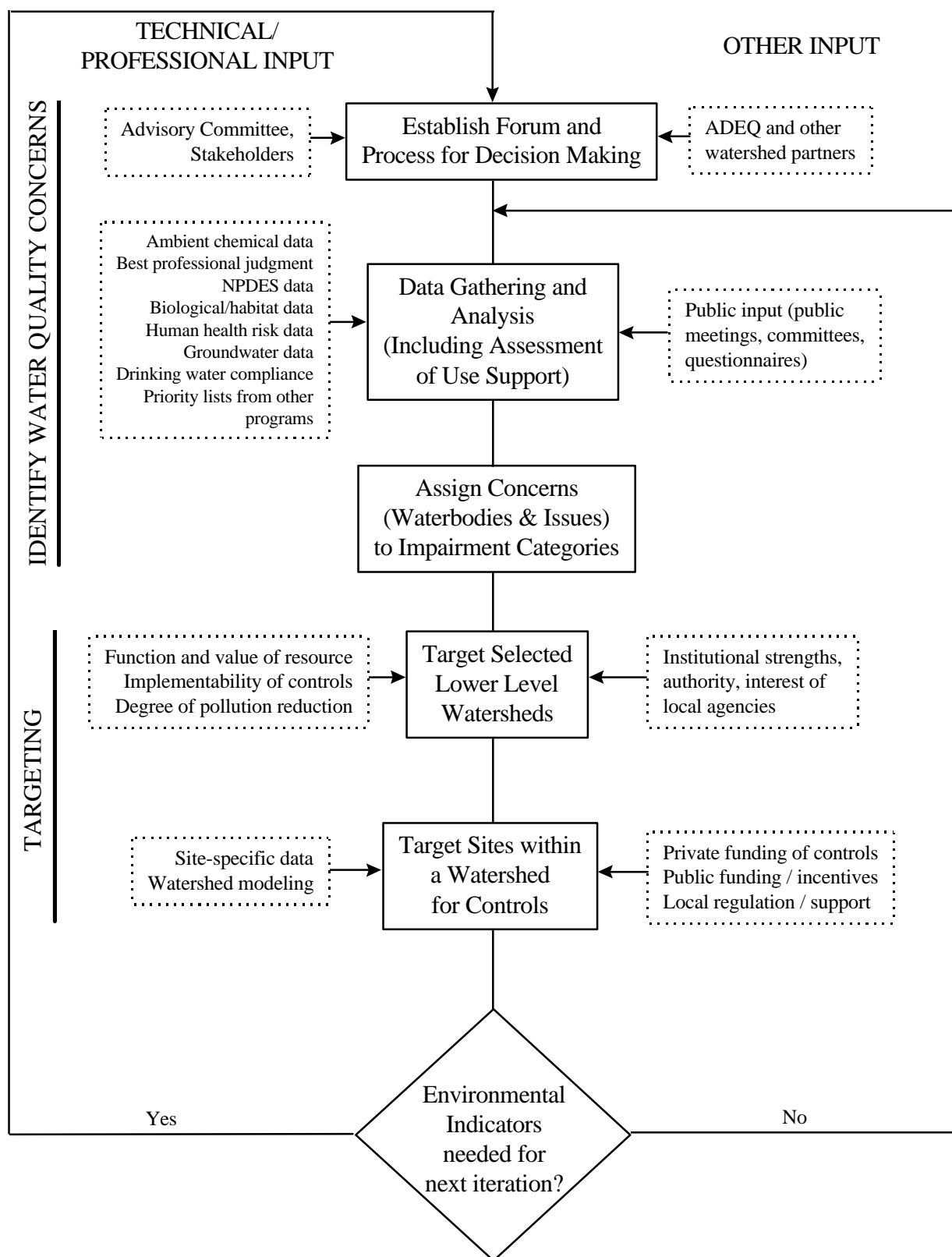
The identification, prioritization, and targeting process is illustrated in Figure 3-3. The first step involves identifying and categorizing water quality concerns. The second step uses environmental and public health factors to create a priority list of concerns. The third step is to select a subset of concerns that are targeted for further consideration. This step requires difficult choices and compromises by all stakeholders, because resources are insufficient to address all water quality concerns that will be identified through the watershed assessment.

Table 3-1. Example Watershed Approach Program Reports, Assessment Methods and Products			
Program/Outputs	Techniques/Methods	Frequency	Adapt to WMZ Cycle?
§314 reports (Clean Lakes Program)	Trophic status index (TSI), DO and Total P model comparison with standards	Semiannual and annual	Yes, projects selected in watershed management zone (WMZ) cycle
§319 (Nonpoint Source): • project identification • grant request • progress report	Project implement Chemistry assessment Stream function riparian monitoring	Semiannual and annual comparison to standards 3-5 years	Yes, project selection using priority and targeting in WMZ cycle
§303(d) TMDL Impaired Waters	<ul style="list-style-type: none"> BOD, DO, NH_4^+, chlorine sediment & phosphorus (no standards)--dynamic models metals 	Schedule negotiated with EPA Region 9	Yes, phased TMDLS consistent with WMZ sequence
Groundwater Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)	Site-specific ground water quality parameters: NO_3^- , RDX; identify plumes through wells, geological assessments (where necessary); pesticides/DRASTIC Inventory of use/application	No set schedule - as necessary No set schedule - as necessary	In most cases In most cases
Stormwater Management Plan	Collecting data, but no current assessment activities (data collection on ~1/3 of permittees, 10% of total are required to report to ADEQ). Have requested 104(b) funds to carry out the program in conjunction with WA	Stormwater monitoring is ongoing	Yes
Standards Review and Implementation	Technical standards review and site-specific standards	Triennial review	Yes, updates by WMZ

Table 3-1. Example Watershed Approach Program Reports, Assessment Methods and Products			
Program/Outputs	Techniques/Methods	Frequency	Adapt to WMZ Cycle?
State Revolving Fund (Federal Loans for Water Quality Management)	Not required to do assessments per se; but were required to do a needs assessment--priority list (water quality & health & population). Nontraditional projects (e.g., physical habitat restoration, NPS BMPs) could be considered under Watershed Approach	No set schedule	Evaluations could be keyed to management strategy development in watershed cycle.
§305(b) Statewide Water Quality Assessment Report - becomes part of Biannual National Report to Congress and the Nation.	<p>Primarily water quality assessments for streams; Water Quality vs. State Standards--evaluate whether supporting designated uses.</p> <p>Lakes data</p> <p>Ground water</p> <p>Drinking water</p> <p>Solid/Hazardous Wastes</p> <p>Superfund sites</p> <ul style="list-style-type: none"> • Biological monitoring --macroinvertebrate data • Biotic Condition Index: Plecoptera/Ephemeroptera/etc. Index • odor & color; modeling of entire watershed management zone - all stations included • Rangeland condition & mouth of watershed (located stations where expected a change in water quality) 	Biannual	Yes, incremental update by WMUs completed in two-year period.

Table 3-1. Example Watershed Approach Program Reports, Assessment Methods and Products			
Program/Outputs	Techniques/Methods	Frequency	Adapt to WMZ Cycle?
Stakeholders - Advisory Committees, Watershed meetings, Partner Agencies	<p>Broad range of watershed specific environmental objectives and indicators (e.g., miles of continuous habitat to support species)</p> <p>BLM, USFS, state and local agency management objectives (e.g., percent impervious surface, open space requirements)</p>	Unknown	Voluntary coordination with WMU cycle to accrue benefits of collaboration

Figure 3-3. The identification, prioritization, and targeting process.



The ADEQ committee assigned the task of designing the watershed framework did not want to define the prioritizing methodology too rigidly or limit it to the use of quantitative tools (e.g., ecological risk assessment). They wanted to create a method that would be expansive enough to consider a broad range of stakeholder concerns. Additionally, the foundation for agreement on objectives is a common understanding of the problems and their severity. However, formal methods and procedures will be available to help rank priority concerns numerically.

ADEQ will develop a list of water quality concerns for stakeholder discussion. This list will be updated based on the results of stakeholder meetings and advisory committee recommendations. Individual site-specific water quality concerns across the watershed management zone will be considered. Concerns will also be clustered into their local watersheds to better define the geographic areas that may require special attention. The intermediate product of the identification and targeting step is a project objectives report for the watershed management zone. The report will describe the prioritized project objectives that are being nominated for the development of management strategies. The report will also detail the decision-making process (e.g., criteria or tools used and level of consensus). The following subsections describe this three-step process.

3.3.1 Use of Environmental Indicators

Environmental indicators are environmentally-related measuring devices that are emerging as a primary component of water quality programs nationwide. Environmental indicators convey useful information on ecosystem quality or reliable evidence of trends in quality. Watershed teams can use this information to assess the general state of the environment and evaluate resource protection programs.

Environmental indicators, developed by watershed advisory committees and partners, provide information to the community and give stakeholders a more realistic assessment of the need for controls or mitigation for stressors. That is, the indicators provide the feedback that enables the watershed team to modify management actions and keep them from being either excessive or inadequate. By using indicators, it may be possible to replace generic national goals or guidance for remediation. Finally, using indicators that are tailored to local conditions allows ADEQ to focus on priority issues.

After all existing information within a watershed has been collected, the information will be reviewed for accuracy and reliability, and the current watershed conditions will be assessed. Assessments may include the following analyses:

Water quality and ecosystem data

- ◆ summary statistics of target water quality constituents to determine the maximum, minimum, mean, variance, and standard deviation for surface water and ground water (includes box and whisker plots);
- ◆ percent of surface water bodies and aquifers with reliable water quality and ecosystem data;
- ◆ designated use support (full support, threatened support, partial support and nonsupport) for surface water;
- ◆ drinking water protected use support for ground water;
- ◆ spatial and temporal separation of data points for surface water and ground water (identify data gaps);
- ◆ biological assessments of surface waters;
- ◆ presence of toxics in sediment and animal tissue;
- ◆ water quality trends;
- ◆ physical and biological assessments of wetland and riparian areas.

Facilities data

- ◆ number, type, and distribution of facilities in watershed;
- ◆ percent of facilities in compliance with state and federal discharge permit requirements;
- ◆ number of public water systems with confirmed MCLs (Safe Drinking Water Act);
- ◆ number of public water systems with advanced treatment for contaminants;
- ◆ number of facilities enrolled in a pollution prevention program;
- ◆ population served by public water systems in a wellhead protection area;
- ◆ new facilities established in last five years;
- ◆ facility closures in the last five years;
- ◆ trends in hazardous waste releases to the environment.

Physiographical data

- ◆ change in land use or land ownership over time;
- ◆ change in population over time;
- ◆ change in streamflow or depth to ground water over time;
- ◆ emerging erosional patterns;
- ◆ change in vegetative cover over time;
- ◆ climatic changes over time;
- ◆ infrastructure enhancements made over time.

The general pattern will be to evaluate disturbances on watershed processes (e.g., hydrology, vegetation, and erosion), how this influences various source inputs (e.g., water, sediment, chemical pollutants, biological, and energy), and the subsequent impact on selected indicators. The goal of the watershed assessment is to determine what characteristics in the watershed are important to water quality. Figure 3-4 illustrates how environmental indicators can be used to evaluate the impact of various stressors on beneficial uses. Watershed assessments are also expected to help determine the vulnerability of a resource to identified stressors and the likelihood that the stressors can be addressed through water quality management actions that stakeholders could support.

ADEQ staff will require enhanced training in order to perform watershed assessments, which will also be more time intensive than following standard program guidance. However, analyses, such as the one described above, target issues essential to maintaining the integrity of water quality and lead to solutions that generate support from a broadly-based constituency.

3.3.2 Factors Considered for Identifying Water Quality Concerns

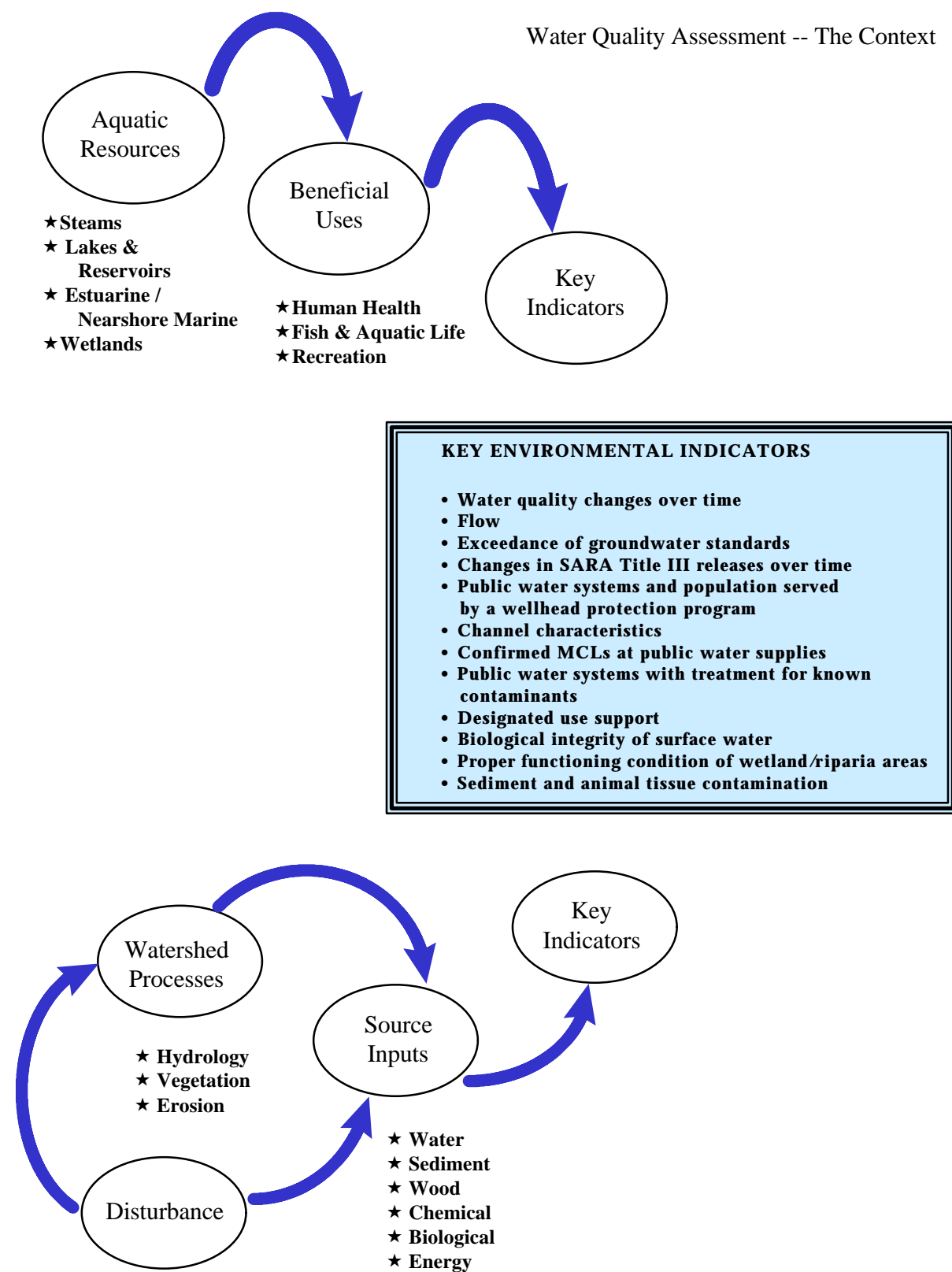
Water quality concerns will be identified in stakeholder meetings and advisory committee meetings. These concerns will be sorted into one of three categories linked to the severity or level of impairment that the concern is considered to pose. Categorization is the first step in the consensus-building process. By assigning the concerns to a category, stakeholders will begin to develop a common understanding of issues to be addressed and will be better able to select which issues to target:

- ◆ **Category A:** Poses a clear and present danger to environmental or human health.
- ◆ **Category B:** Has a significant impact on the beneficial uses of the waterbody.
- ◆ **Category C:** Is a stressor, but associated water quality and ecosystem impacts are marginal or uncertain.

The advisory committees and watershed partners can develop alternative definitions to address proactive or preservation objectives. Several factors can be used to assign water quality concerns to the categories described above:

- ◆ **Public Health and Public Use:** Waters having a high degree of public use would be given priority over waters infrequently accessed. The state already has methods for rating public use of streams and lakes. Surrounding population was suggested as a measure for the ground water index. The public use factor would not apply to wetlands and places equal emphasis on protection and restoration.
- ◆ **Beneficial Uses:** This factor would be used to assign value to types of designated beneficial uses for surface waters (beneficial uses for ground water are the same across the state). For instance, a higher priority may be placed on protecting a public drinking water supply than a warm-water fishery. The focus of this factor is therefore on protection. The following use categories would apply:
 - ◆ Raw water source for domestic uses,
 - ◆ Recreation use and aesthetics,
 - ◆ In-stream use by aquatic life, and
 - ◆ Agricultural uses.
- ◆ **Use Support Status:** This factor would prioritize waters according to their degree of impairment. The focus of this factor is on restoration. The categories for impairment used in CWA §305(b) reporting could be assigned numerical ratings and applied to the surface water indices (i.e., fully supporting, support threatened, partially supporting, and not supporting). For ground water, impairment of beneficial uses could be rated using monitoring data to distinguish between risk levels for parameters such as nitrates and pesticides.

Figure 3-4. Use of environmental indicators to evaluate the impact of potential watershed stressors on beneficial uses.



- ◆ **Ecological Value:** An ecological value factor could be used for surface water indices to address protection of designated state resource waters, wetlands, and threatened and endangered species. This factor could be in the form of a narrative rationale for preserving, mitigating, or restoring the function or value of a particular resource. For example, a wetland would be evaluated within the context of what hydrological, water quality, and biodiversity functions it provides to the watershed. That is, does the wetland's existence serve to attenuate peak flows (hydrological), trap pollutants (water quality), or incubate some form of wildlife (biodiversity). What significance does a particular wetland have in the watershed relative to the remaining wetland resources?

Sustainability: The purpose of including sustainability as a factor is to assess the impact of accumulated uses and stressors on the long-term viability of the resource. That is, can the resource be maintained for several generations at the current level of use and impacts from stressors. In some cases sustainability may be relatively easy to determine. For example, are ground water levels falling under the current pumping regime and are nitrate levels increasing under current uses? Long-term impacts may be more difficult to determine for other ecological features.

During each watershed management cycle, additional stakeholder factors will be identified that will also be used to assign concerns to categories.

The watershed approach has several mechanisms and opportunities for ensuring stakeholder involvement in the process. The stakeholder category addresses additional factors that stakeholders may identify in the planning process for each watershed management zone. Stakeholder objectives can be developed at several points in the process:

- ◆ **Step 1:** Formulating specific goals and objectives during watershed advisory committee proceedings and at meetings.
- ◆ **Step 2:** Refining objectives following the assessment step.
- ◆ **Step 3:** Identifying specific measures of success.

The importance of these opportunities for developing stakeholder objectives is that not all objectives for watershed management units are predetermined or prescribed. Some objectives may apply in one management unit and not another.

3.3.3 Prioritizing Methodology

ADEQ is developing a system to prioritize waterbody issues. The prioritization process ranks watershed concerns by category in order of their importance; the resulting list will be incorporated in the watershed plans. After the waterbodies have been prioritized, specific ones will be targeted to direct program and private resources for effective management of these waters. The system will need to be in place by 1998 to be applied to the Verde and Upper Gila watersheds according to the watershed cycle schedule.

Recommendations drawn from the Water Quality Division's work to date on the waterbody prioritization system include the following:

- ◆ Numerical indices may be used to provide a quantitative comparison between waterbodies.
- ◆ Criteria used in the numerical indices will be independent of each other to avoid biasing results.
- ◆ Multiplicative approaches to combining index factors are being considered since they tend to be sensitive to differences in factor values and will better differentiate waterbody rankings.
- ◆ All waterbodies that meet minimum data requirements for assessment will be prioritized. The priority listing will therefore include all assessed waters ranked from highest to lowest management priority within each category (A,B, or C).
- ◆ Separate indices will be developed for streams, lakes, wetlands, and ground water. A single priority system is not appropriate because factors differ by waterbody type. For instance, use of ecological value criteria would have little meaning for ground water, just as wetlands might not be fairly considered if a public use factor is applied.
- ◆ Waterbody segments listed in the most up-to-date Reach File will be used as the basis for prioritizing surface waters. These segments are well defined, are the units used by ADEQ for CWA §305(b) reporting and §303(d) listing, and the majority have designated uses assigned to them. They are small enough to reflect local problems and can easily be aggregated to reflect larger-scale concerns.
- ◆ Aquifers as defined by the Arizona Department of Water Resources will be used as the basis for prioritizing ground water. These units are consistent with those used in the Arizona Administrative Code Title 18 Chapter 11.

These factors should be included in the numerical indices:

- ◆ **Designated Use:** This factor will be used to assign value to types of designated uses for surface waters. For instance, a higher priority may be placed on protecting a drinking water supply than a warm-water fishery.

Aquifers throughout the state are classified as having either a “drinking water protected use” or a “nondrinking water protected use.” Aquifers classified as having a “drinking water protected use” would receive a higher priority rating.

- ◆ **Use Support Status:** Under this criterion, waters will be rated according to their degree of impairment as listed in the CWA §305(b) report and would be assigned numerical ratings based on the degree of impairment (fully supporting, support threatened, partially supporting, and not supporting). For ground water, impairment will be rated using monitoring data to distinguish between supporting and not supporting the “drinking water protected use.”
- ◆ **Public Use:** Waters having a high degree of public use would be given priority over waters infrequently accessed. Surrounding population will also be used as a measure for the ground water index.
- ◆ **Ecological Value:** An ecological value factor will be used for surface water indices to address protection of unique waters, wetlands, threatened and endangered species.

3.3.4 Targeting Criteria

Targeting is the final step that narrows the list of concerns to match the level of resources available for use within the watershed. The following criteria have been defined to assist in those determinations:

- ◆ **Fulfill Agency Mandates:** Mandates assigned by state or federal legislation must be addressed. The watershed approach introduces a great deal of flexibility in how to meet mandates.
- ◆ **Level of Stakeholder Support:** This category involves assessing factors, such as the degree of public interest, availability of local funding, and amount of support by other resource agencies, that are integral to implementing management measures. This criterion will need to be a qualitative assessment using categories such as high, medium, or low. Assignment to a particular category will be based on public meeting participation, written contributions/responses to the watershed plan, steering committee support, contributions of resources from partner agencies, and, in some cases, formal surveys.

- ◆ **Scale of the Problem:** Evaluating manageability could include such factors as the feasibility of mitigating water quality problems or protecting the watershed, cost, size of the watershed, time necessary to correct the problem, opportunity for success (e.g., ability of agencies to work together or capability to deal with the problem), and amenability to available tools and controls.
- ◆ **Likelihood of Success:** If there is no clear goal that can be defined as a measure of success for a project objective, the objective should not be considered for targeting.
- ◆ **Resource Availability:** Managers should consider such elements as project funding eligibility (i.e., constraints regarding use of resources), availability of funds for specific purposes, and overall water strategy (i.e., allocation of resources). Resource allocations may be constrained by federal, state, agency or watershed management goals. Thus, a fixed amount of resources may need to be allocated to a variety of waterbody types or for different program-specific areas (e.g., point source versus nonpoint source problems).
- ◆ **Adequacy of Available Information:** Data may be sufficient to assess the waterbody, but insufficient to quantify the problem for management purposes. If the problem cannot be quantified satisfactorily, then a data gap would be identified to be addressed in the future; information on data gaps would also be shared with those responsible for updating annual monitoring strategies.
- ◆ **Manageability:** Evaluating manageability includes such factors as feasibility of mitigating water quality problems or protecting the watershed, cost, size of watershed, time necessary to correct problems, opportunity for success (e.g., ability of agencies to work together or capability to deal with the problem), and amenability to available tools and controls. For example, a large watershed with numerous conflicting and/or political problems may have a low potential for success as compared to a smaller, nonpolitical watershed with a single problem source.
- ◆ **Program-specific Funding:** Managers should consider such elements as project funding eligibility (i.e., constraints regarding use of resources) and the availability of funds for specific purposes.
- ◆ **Program Constraints:** Program actions may be limited by personnel and operational resources.

- ◆ **Goals:** Resource allocations might be constrained by federal, state, local or watershed management goals. Thus, a fixed amount of resources may need to be allocated to a variety of waterbody types or for different program-specific areas (e.g., CWA §303(d) listed waterbodies and the need for TMDLs on these waterbodies).
- ◆ **Other Targeting Criteria:** Stakeholders may recommend additional criteria.

3.4 DEVELOPMENT OF WATERSHED MANAGEMENT STRATEGIES

Watershed advisory committees and watershed partners will evaluate the targeted issues and begin to develop a general management strategy for the watershed. The committee will provide the forum for developing a collaborative response to specific project objectives. This collaboration makes a wider range of mitigation options possible, which increases the likelihood of finding cost-effective, environmentally sound solutions.

For example, restoration of physical habitat along a degraded stream channel can increase a stream's capacity to respond to pollutant loading. Ultimately, this can be a more cost-effective solution for restoring biological integrity than using more stringent pollutant loading requirements. The participation of natural resource management agencies and private stakeholders in the watershed framework makes physical habitat restoration a more feasible option.

3.5 CONSIDERATIONS FOR IMPLEMENTATION

Water quality is affected by a complex set of both natural and human factors that occur within watersheds. The downhill flow of water means that factors in one location of the watershed can have a significant influence on water quality far removed from the initial event. Since no one agency or stakeholder can effectively address all of these factors, ADEQ recognizes the need for an approach that integrates the activities of watershed stakeholders.

History has much to teach about the limitations of highly-centralized authority. No one figure can match the collective wisdom of sincere, concerned individuals and groups representing a broad range of interests. Voluntary participation is critical to successfully addressing the complexities of a watershed.

One of the primary objectives of the watershed approach is to provide an open process for meaningful voluntary involvement in water quality management by a broad range of stakeholders. Where possible, ADEQ would prefer to identify and support existing local sponsors of watershed activities. Where a local sponsor does not exist, ADEQ will serve as a catalyst to recruit or develop local sponsorship for the watershed approach. Local, state, and federal agencies and tribes are good candidates for either sponsor or partner in watershed management zones.

3.5.1 Individual Watershed Plan Implementation

The implementation element is addressed in Step 6 of the watershed management cycle. Implementation in this context refers to carrying out water quality management activities in individual watersheds as described in their watershed plans. The implementation step distinguishes the watershed approach from a planning program such as the one formerly supported by Section 208 of the Clean Water Act.

Guidance for implementing each watershed plan will be linked to the goals identified by stakeholders during the planning process. The advisory committees should develop this guidance and it should include the following:

- ♦ Establish performance objectives for participating programs and agencies;
- ♦ Provide the basis for organization and staff performance reviews;
- ♦ Describe how the planning process and compiled information will be used for grant applications to state and federal funding entities;
- ♦ Describe how the recommended actions will fulfill local, state, and federal requirements and needs;
- ♦ Define areas of collaboration between participating programs and agencies (e.g., nonpoint source and NPDES coordination on load reduction strategies for TMDL waters);
- ♦ Provide a detailed schedule of activities; and
- ♦ Describe watershed issues and management strategies that specific activities will address.

Figure 3-5 illustrates the matrix that Utah, Delaware, Nebraska and the Anacostia River Project in Virginia have successfully used in their watershed approach. The matrix summarizes watershed partner commitments to implement project objectives that are keyed to stakeholder goals. The goals and project objectives listed in Figure 3-5 are general and hypothetical; the actual ones would be developed by stakeholders and would be more specific.

3.5.2 Statewide Implementation

ADEQ has already started to phase in use of the statewide watershed framework. Full implementation, however, will take several years. That is, not all of the options described in this framework document will be implemented immediately. Section 4 describes the plan for transition to a watershed approach. Publicizing this sequence is important because watershed management cycles will not be initiated in all watersheds at the same time. The Verde River and San Carlos Safford Duncan watersheds have already been started because of existing watershed-scale efforts.

This framework document provides an implementation plan to identify where ADEQ's staff and financial resources are being committed through the watershed approach. The definition of the watershed management cycle and the spatial and temporal coordination of program resources will be a useful planning tool for balancing program workloads and resource allocation. Many ADEQ activities, however, will be unaffected by the schedules associated with the watershed approach, including responding to time-sensitive permits and unplanned emergency response to environmental problems.

Figure 3-5. Hypothetical Watershed Management Zone Goals, Objectives, and Stakeholder Matrix							
Agency Stakeholder Key: <div> <div>ADEQ: AZ Department of Environmental Quality</div> <div>EPA: U.S. Environmental Protection Agency, Region 9</div> <div>NRCS: Natural Resource Conservation Service</div> <div>COG: Council of Government</div> <div>DWR: Division of Water Resources</div> <div>Others: Tribes, Watershed Associations, Bureau of Land Management</div> <div>LA: Local Agencies</div> <div>National Parks Service, etc.</div> </div>							
Goals/Project Objectives	ADEQ	NRCS	DWR	LA	EPA	COG	Others
Goal 1 - Control of Pollutant Inputs							
Stormwater Assessment and Control Plan							
Sewage Wastewater Treatment Planning and Control							
NPDES Permits: Use correct low flow values to calculate WLAs; Meet metals standards; consider site-specific standards for metals							
Point/NPS Trading Program							
NPS BMPs							
Stream reclassification							
Goal 2 - Ecological Restoration							
Support ongoing riparian habitat protection and restoration projects							
Planning to ensure critical minimum low flows							
Redesign diversion and return flow structures to minimize impact on stream channel							
Goal 3 - Habitat Preservation							
Coordinate with other programs in the watershed to support parkway, meander corridor, and wetlands restoration							
Conservation easement program to assist with completion of parkway riparian corridor							
No further wetlands loss in watershed: Initiate watershed scale planning							

Figure 3-5. Hypothetical Watershed Management Zone Goals, Objectives, and Stakeholder Matrix							
Agency Stakeholder Key: ADEQ: AZ Department of Environmental Quality NRCS: Natural Resource Conservation Service DWR: Division of Water Resources LA: Local Agencies EPA: U.S. Environmental Protection Agency, Region 9 COG: Council of Government Others: Tribes, Watershed Associations, Bureau of Land Management National Parks Service, etc.							
Goals/Project Objectives	ADEQ	NRCS	DWR	LA	EPA	COG	Others
Goal 4 - Public Health / Drinking Water / Ground Water							
Comprehensive groundwater protection policy to prevent further degradation of shallow aquifers in the watershed							
Ensure adequate drinking water supply for projected needs.							
Goal 5 - Biodiversity/Biological Integrity							
Improve timing and location of diversions and return flows							
Species landscape Needs Analysis: Contiguous habitat corridors							
Goal 6 - Sustainable Economic Development							
Plan for growth							
Eliminate excessive soil loss							
Goal 7 - Stewardship							
Watershed meetings; Watershed Plan & newsletter; Advisory Committee(s)							

! Note that in actual application, matrix boxes will be replaced with implementation dates

3.5.4 Watershed Partners: How To Define Your Role

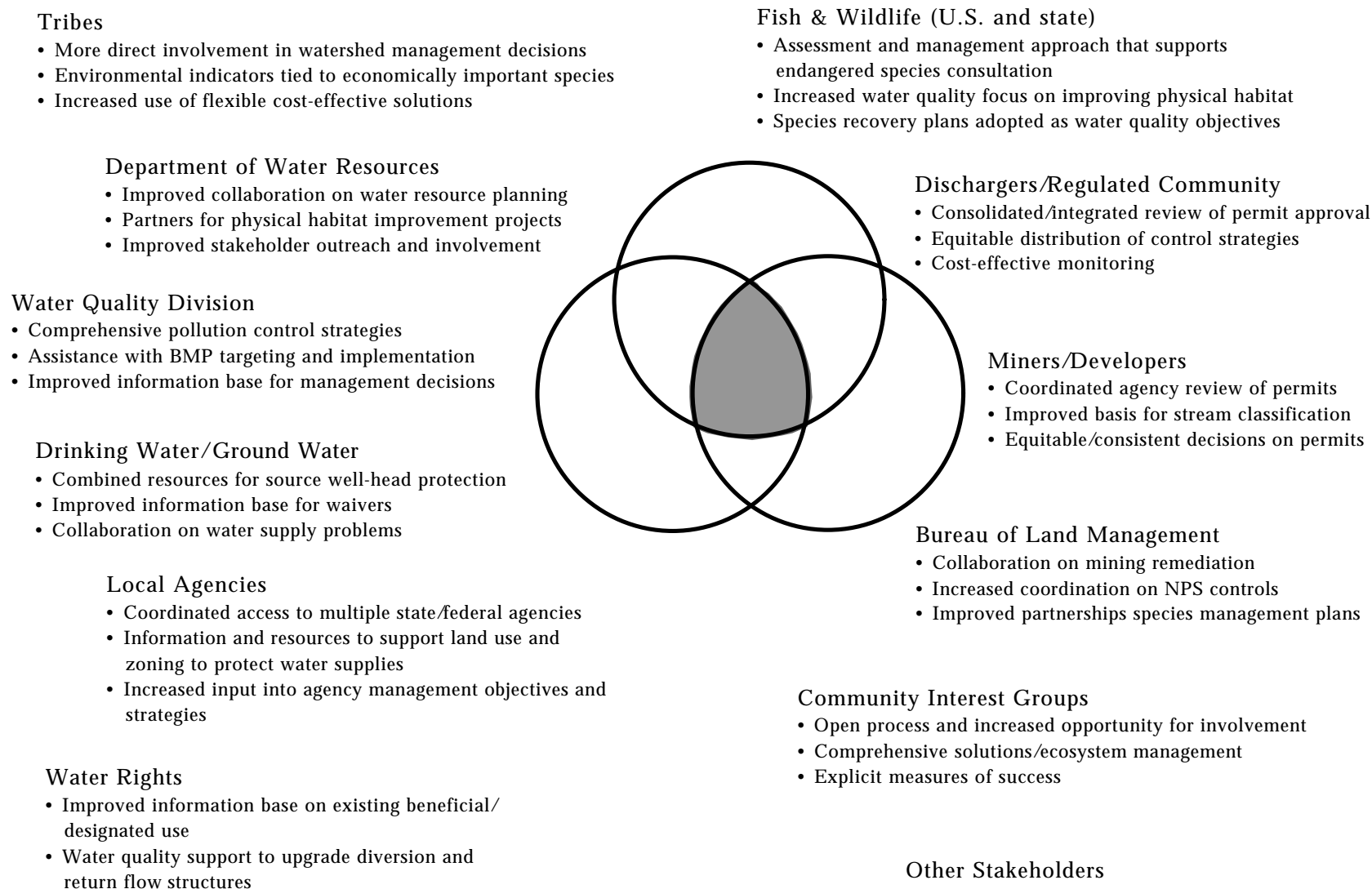
Specific roles and responsibilities of ADEQ or any other watershed partner will vary from one watershed to the next, and each watershed partner can determine its role and responsibilities within a watershed working in association with other partners. Arizona has witnessed many examples of water quality problems that were the result of more than one factor and the solution involved the coordinated activities of several stakeholders.

Watershed partners will want to consider what roles, incentives, resources, expertise, or information they may bring or receive as a result of participating as a watershed partner. Potential partners are encouraged to consider their efforts in relation to others to reinforce the concept of integrated management. In future editions of this document, examples of collaborative management will be included as case studies.

Who should consider becoming a watershed partner? What is their role? That is, what does a partner bring to the collaborative process and how might they benefit from that participation. The answers to these questions will determine how the overall work of developing and implementing a watershed plan can be divided among stakeholders. They, in turn, benefit from the combined strength of the partnerships and the more efficient use of resources. These benefits can be thought of as an intersection of mutual priorities, as illustrated in Figure 3-6.

Table 3-2 contains a list of potential watershed approach partners that ADEQ anticipates will find the framework a useful coordination tool. The list in Table 3-2 is not intended to be complete; there are certainly future participants who will have a significant role in the watershed advisory committees who do not appear below. The list also does not imply that all the listed partners will participate in every watershed advisory committee or project. It is expected that a partner will participate only in those initiatives where their capabilities are needed or their interests are significantly affected. It is important to note that ADEQ is not prescribing any role for any partner.

Figure 3-6. An Intersection of Mutual Priorities



For those unfamiliar with any of the partners listed in Table 3-2 summary descriptions of each have been included in Appendix A. Appendix A descriptions of watershed partners includes duties, functions, mandates, and capabilities. The descriptions for ADEQ programs are more complete than those of other partners. The descriptions for potential watershed partners outside ADEQ cover only broad areas of responsibility. One exception is the description for U.S. EPA Region 9 which includes a schedule for NPDES permits that has been made consistent with the schedule for each watershed management zone. Appendix A descriptions are not intended to be prescriptive, but could serve as a starting point for partnership discussions. Each partner maintains primacy over its respective mission and/or budget. Cooperation on specific tasks is completely voluntary through mutual agreement between the involved parties.

ADEQ recognizes its own need for a more integrated approach to assess conditions and develop management strategies, one that better reflects the integrated character of ecosystems and the communities within them. The Water Quality Division and its sections are using the questions listed below to develop activity plans within watershed management zones. Therefore, the descriptions of example activities included in this section emphasize ADEQ programs—particularly Water Quality Division programs. This reflects the Water Quality Division’s decision to adopt the watershed approach to organize its own activities. The issues raised are offered as a starting point for watershed partners to develop their own visions of their roles in ways that better reflect their interests, resources, mission, mandate, and capabilities.

This framework is meant to be a living document. Participants are encouraged to modify their organization’s examples or description to accurately portray their strengths and meet their needs. The first edition of this living document is sure to undergo many changes in the next few months as more and more potential partners become familiar with it and provide their input. In reading this document, reviewers should consider the following:

What water resource issues concern you, either locally or statewide?

Are there other stakeholders whose interests conflict with yours?

Are there other stakeholders whose interests you share or whose interests relate to yours?

What activities of yours seem to duplicate the activities of others?

Are there activities of others that could complement yours?

What activities would benefit from timely coordination within a watershed cycle step?

What information would be useful if consolidated within a watershed plan?

What resources (expertise, time, people, funding, "other") would enhance implementation of watershed plan management activities if they were pooled?

ADEQ is confident that the actions developed and undertaken through the watershed approach using its principles, procedures, and questions listed above will result in improved management, use, and protection of Arizona's water resources.

Table 3-2. EXAMPLES OF POTENTIAL WATERSHED PARTNERS WITHIN A WATERSHED FRAMEWORK	
Arizona Department Of Environmental Quality	
Water Quality Division Director's Office Water Protection Approvals and Permits Program Water Quality Compliance Program Drinking Water Program Hydrologic Support and Assessment Program Water Quality Planning Program	
Other ADEQ Divisions and Offices	
Waste Programs Division Air Quality Division Information Systems Development Office	
Arizona State Agencies and Programs	
Arizona Department of Water Resources Arizona Department of Health Services Arizona Game and Fish Department Arizona Department of Agriculture Arizona State Land Department Arizona State Parks Arizona Department of Transportation University of Arizona Cooperative Extension Arizona Corporation Commission	
Local Governments, Special Districts, and Authorities	
Citizens Local Governments Councils of Governments County Health Departments and Departments of Environmental Quality The Salt River Project Sanitary Districts Natural Resource Conservation Districts	
Tribal Governments	

Table 3-2. EXAMPLES OF POTENTIAL WATERSHED PARTNERS WITHIN A WATERSHED FRAMEWORK	
Federal Agencies	
United States Environmental Protection Agency Federal Emergency Management Agency National Aeronautics & Space Administration National Science Foundation U.S. Department of Agriculture Natural Resources Conservation Service U.S. Forest Service U.S. Department of the Interior U.S. Bureau of Indian Affairs U.S. Bureau of Land Management U.S. Bureau of Reclamation U.S. Fish and Wildlife Service National Park Service U.S. Geological Survey (USGS) U.S. Department of Defense Department of the Army U.S. Army Corps of Engineers Department of the Air Force Department of the Navy U.S. Department of State/Estados Unidos Mexicanos Ministeros Estada International Boundary and Water Commission U.S. Department of Health & Human Services U.S. Indian Health Service	
Interest Groups	

SECTION 4

TRANSITION TO THE WATERSHED APPROACH

The transition from a program-centered approach to the watershed approach involves a fundamental change in the functional relationships among individual agencies and programs operating under various water quality management mandates. Substantial coordination is required for Arizona to make this transition. This section addresses the immediate and long-term considerations as well as other aspects of the process leading to the implementation of the watershed approach.

4.0 PROGRESSIVE FRAMEWORK IMPLEMENTATION

Proposed implementation of the watershed approach will be phased in across the state over the next five years. The sequence for convening ADEQ's activities in watershed management zones was presented in Section 2. While some changes in core programs will occur immediately, others will be phased in as the management cycle progresses. This framework document describes many possible options for watershed management. Some of these options will not be feasible until the statewide watershed framework expands beyond the ADEQ. New options will be added as other stakeholders become partners. However, in considering expectations for the watershed approach, it is important to note that the scale of activities within each step of the management cycle for all watershed management zones will reflect the resources available and the level of participation by other stakeholders.

ADEQ has initiated its watershed approach activities in the Verde River and San Carlos/Safford/Duncan watershed management zones. The existing level of activities and the presence of sponsoring organizations made these two zones a logical starting point in the statewide sequence. ADEQ adapted the watershed cycle steps to synchronize its activities with the ongoing watershed initiatives. Many of the stakeholder outreach and involvement tasks in Step 1 have already been completed. ADEQ is currently assisting with the collection of environmental information to support watershed planning and implementation efforts in both zones.

Other short-term statewide objectives are listed below:

- ◆ Review of framework by other stakeholders.
- ◆ Convene a workshop for ADEQ staff and other stakeholders on implementing the watershed approach.
- ◆ Address reviewers' comments to this edition of the *Statewide Watershed Framework* document.
- ◆ Designate team leaders for active watershed management zones.

The scale of activities will reflect the level of participation and resources available

- ◆ Establish the ADEQ Section Managers Round Table for developing assignments and allocations for active watershed management zone support teams (including staff assignments to teams).
- ◆ Amend and update relevant work plans to reflect watershed approach activities and objectives, including the EPA Region 9 Performance Partnership Agreement.

4.1 PROGRAM COORDINATION WITH THE WATERSHED APPROACH

A key component of implementing the watershed approach is the continually growing coordination needed among participating programs and agencies. Eventually, program coordination will also require phased implementation as participants recognize and take advantage of opportunities. The potential areas for early program coordination and their administration are the subject of this section.

Program coordination is probably the single most important key to success for the watershed approach. The many participants and the wide range of activities involved will require substantial coordination. Watershed management zones, targeted local watersheds and the overall watershed approach activity schedule (see Section 2) provide the framework for coordination. Programs and individual participants will be responsible for adhering to the schedule and carrying out their duties in a coordinated manner. To ensure that the greatest coordination possible is actually achieved, ADEQ has included other provisions.

Administration of ADEQ's activities within the watershed approach will be centrally coordinated by ADEQ's Section Managers Round Table, who will maintain close coordination with EPA Region 9. EPA Region 9 will continue to oversee allocation of federal funds to support ADEQ's watershed approach activities and compliance with federal mandates and regulations. The ADEQ / EPA Region 9 Performance Partnership Agreement will be the mechanism for coordinating federally funded activities (work tasks in the agreements should reflect activities as scheduled under the management unit's cycle).

The Section Managers Round Table will develop guidance for staff on activities that will proceed on a schedule independent of the watershed cycle; that is, not all ADEQ functions will be incorporated into the watershed approach. For example, time-sensitive permit applications will be addressed within established guidelines for response. The determination of which activities will be included in the watershed cycle could be done for each watershed management zone. This determination should be made promptly for all active watershed management zones. In addition, ADEQ will continue to conduct operations in locations outside of active watershed management zones. As more of the statewide sequence is implemented, the balance of activities and resources will shift to those areas within the watershed approach.

Program coordination and adherence to schedule are keys to success

A full-time statewide coordinator is being added to the ADEQ staff to support administration activities of the watershed approach framework. This position is a long-term personnel need that will become more critical as the number of programs and watershed management zones increases. Proposed duties for this coordinator position include:

- ◆ Compiling the advisory committee's needs summary document for the ADEQ Section Managers Round Table;
- ◆ Coordinating the completion of all identified watershed approach activities according to the time frames established in the statewide watershed management zone sequence;
- ◆ Consulting with ADEQ's watershed support team leaders to identify and document research and management needs;
- ◆ Coordinating the ADEQ personnel calendar for participation in stakeholder and public outreach meetings and general public outreach and technology transfer activities in each watershed management zone;
- ◆ Assisting ADEQ watershed support teams with the preparation and update of all monitoring plans, quality assurance plans, and management plans related to the watershed approach;
- ◆ Serving as a liaison between ADEQ and other agencies, organizations, stakeholders and the public for watershed approach activities; and
- ◆ Coordinating the update of the ADEQ *Statewide Watershed Framework* document.

Statewide
coordinator's
position

4.2 INTERIM TASKS AND WORKLOAD CONSIDERATIONS

Several tasks have been identified for completion early in the transition to the watershed approach. Some tasks represent a continuing responsibility under the watershed approach. Other activities will not be performed on a regular basis, such as those related to introducing the watershed approach to stakeholders and those involved in developing and establishing technical or administrative procedures. ADEQ's internal integrated work plan should provide sufficient guidance and documentation of interactions following the workshop.

4.2.1 Initial Outreach to Explain the New Watershed Approach Framework

With assistance from senior ADEQ management, the watershed work group will plan and conduct an implementation workshop for ADEQ staff and other key watershed partners. The purpose of the workshop is to provide ADEQ with an early review and evaluation that will prove invaluable in refining the watershed approach prior to full-scale implementation. The workshop will also provide key participants with an understanding of how they can coordinate their operations with the watershed approach to the extent that they determine they have complementary objectives. Federal and state programs that can coordinate their activities statewide in conjunction with the watershed approach will be targeted for briefings early in the transition period. ADEQ can use public meetings and other forms of outreach in the watershed management zones to present the watershed approach to public stakeholders. As the statewide sequence of developing watershed management zones moves forward, the outreach effort for each new watershed management zone will become more intensive.

ADEQ-sponsored
implementation
workshop

Targeted briefings

Public meetings

4.2.2 Changes In Planning and Management of Staff and Resources

The sequencing of watershed management zones and the cycle for activities provide managers with a powerful planning tool for estimating resources that will need to be committed to the watershed approach. (Not all ADEQ resources will be involved in implementing the watershed approach.) Senior managers will need to develop a planning model for resource allocation that is consistent with the activity cycle in each watershed management zone. Program managers will use this model to begin estimating staff and resource needs that are keyed to the cycles and priorities the advisory committees have targeted. The ADEQ Section Managers Round Table will have regular meetings to adjust workload and resource assignments in the ADEQ watershed support teams, and to review progress.

Planning model for
resource allocation

Workload
adjustments

In addition, managers and staff can anticipate requirements using the watershed management zone sequence. For example, a large watershed management zone may require substantial outreach resources, while a sparsely populated watershed management zone may require only minimal staff for this function. Watershed management zones will vary with respect to the amount and type of assessment needed, and the cycle will help to anticipate such needs in annual planning. As the management strategy for each unit evolves, ADEQ will have a better tool for estimating implementation requirements. ADEQ staff and managers may want to participate in representative exercises to become familiar with the planning protocols of the watershed approach.

Management strategies differ for each zone

Managers will continue to have final authority over the commitment of their program resources to a watershed management zone task or project. Managers will be expected to oversee staff involvement and be responsible for final consent on decisions that have been negotiated among the ADEQ watershed support teams. Staff will likely be assigned to participate in activities on more than one watershed management zone. Performance criteria for staff will be based on their team responsibilities. Because the watershed approach is no longer primarily focused on programs, managers may need to develop new performance measures that are consistent with the measures of success adopted by the watershed management zone team. ADEQ operations will become more dependent on teams made up of staff from more than one program. This may require a management approach with characteristics consistent with matrix management as opposed to the existing hierarchical (line management) organizational method.

New performance measures needed

4.2.3 Synchronizing Permit Expiration Dates with the Watershed Approach Cycle

The comprehensive loading analysis and reduction strategies of the watershed approach would be enhanced if a schedule could be established that synchronizes NPDES and ADEQ permits with the statewide watershed management zone sequence. NPDES and ADEQ permits could be issued by geographic subunits within each watershed management zone, beginning with the completion of the watershed management zone plan. This geographic division will allow waste load allocation (WLA) decisions and permit conditions for dischargers in the same lower order watershed to be developed at the same time, providing a basis for continuity and consistency. Also, the synchronized permit schedule will allow for consolidation of public notices and public meetings, making ADEQ's process more efficient and providing the public with the opportunity to see the "big picture" of point source controls within the watershed and local region.

Schedule to synchronize permits will make the process more efficient

At a minimum, each permit within a watershed management zone should be examined and analyzed during Step 3, the watershed assessment. ADEQ will work with EPA Region 9 to develop a coordinated plan for notification of permit holders. If new information produced during the intensive monitoring phase suggests the need for an adjustment in a permit, several courses of action are available: the current expiration date of the permit may be sufficiently close to not change the time sequence; or the permit may be modified by an addendum; if warranted, the permit could be opened for relicensing immediately.

Eventually NPDES and ADEQ permit expiration dates must be changed from their historical issuance cycle to implement the synchronization schedule, a transition that will require time and could be done over more than one planning cycle. Other ADEQ permits will be made consistent with the watershed approach cycle, where appropriate.

4.2.4 Data Management System

The information used in the planning process and in completing the written plan will be gathered by many stakeholders. In most watershed management zones, ADEQ will be responsible for analyzing and compiling this information. In many cases, ADEQ will be responsible for writing the watershed management zone plan. ADEQ, therefore, must develop a database for each watershed management zone and procedures for using the AZURITE system to store and retrieve broad categories of information for each watershed management zone. While the system must be secure, it must also allow access to stakeholders with legitimate interests in the information. One way to accomplish this access would be to make AZURITE capable of being accessed from public facilities (e.g., libraries, public schools, local agencies). ADEQ's existing hardware and software can meet these needs, but training may be necessary. AZURITE should also be able to support information clearinghouses, when they become established, for the watershed management zones. One possible form of stakeholder access is an Internet home page for each watershed management zone.

Database for each watershed management zone

Access to information

4.2.5 Work Plan Agreements with EPA Region 9

Ideally, state/EPA work plan agreements will continue to be streamlined to facilitate and support development and implementation of the ADEQ watershed approach. ADEQ and EPA Region 9 will need to schedule discussions on how the watershed approach process can be used to more efficiently and effectively fulfill federal reporting requirements, such as those found in CWA 303(d), 305(b), 314 and 319(a). The preferred solution is to allow these reports to be accomplished in a manner that is consistent with the statewide sequence. Furthermore, the watershed approach provides a new mechanism for grant planning and for fulfilling 106 water quality planning requirements. Meeting these objectives will be negotiated with EPA Region 9 as part of the Performance Partnership Agreement.

Fulfilling federal reporting requirements

4.3 TECHNICAL RESOURCE AND RESEARCH NEEDS

This section describes the technical resource gaps and research needs that have been identified during the process of developing the *Arizona Statewide Watershed Framework* document. Addressing these gaps would further enhance management capabilities.

4.3.1 Training for ADEQ Watershed Support Team Leaders

The position of ADEQ watershed support team leader requires a diverse set of skills. The team leader position will involve negotiation, facilitation, and project management skills not required in the previous program approach. The watershed approach will place an increased emphasis on communication and teaching. Consideration should be given to instructing candidates for the position in these areas.

4.3.2 Information Clearinghouses

In other states where the watershed approach has been implemented, they are beginning to use independent information management clearinghouses for information management and communication support within watershed management zones. Stakeholders and watershed partners can share the responsibility for maintaining this critical element. ADEQ could develop a brochure that describes existing information management clearinghouses, including chartering issues, board formation, funding arrangements, hardware requirements, information management procedures, and software options. The brochure can provide guidance to advisory committees for establishing their own information management clearinghouses.

4.3.3 Training for the Development and Use of Arid Area Environmental Indicators

The watershed approach is an assessment-driven program that will rely on environmental indicators at several points in the decision-making process. Advisory committees and ADEQ watershed support teams will require assistance in developing meaningful water quality indicators for arid systems. The use of environmental indicators is an important bridge between official water quality decision points and those that the public is more familiar with. Workshops to train staff should be arranged to provide background on the development and use of environmental indicators. Indicators have been developed already for other program areas (drinking water, storm water) and resource types (wetlands, streams, watersheds).

4.3.4 Guidance for the Formation of Advisory Committees

A brochure or pamphlet should be developed that provides resource information and describes the role and procedures for starting advisory committees in each zone. The Verde River Watershed Association could be used as a prototype. Several questions regarding the public-private partnerships formed within the advisory committees are still unanswered.

4.4 STRENGTHENING PARTNERSHIPS

The statewide watershed framework will provide the basis for strengthening ADEQ partnerships with other stakeholders. Stronger partnerships with Arizona's COGs are a likely starting point. ADEQ also desires to continue exploring options for leveraging its resources with other stakeholders so that shared goals for conserving resources can be achieved. Joint monitoring and assessment projects among several stakeholders (e.g., DWR, EPA, USGS, NRCS, and USFWS) could be accomplished on a statewide scale under the watershed approach. ADEQ will recruit agencies to serve as temporary sponsors in watershed management zones that have no existing local sponsor. The role of temporary sponsor is necessary in those zones that require a catalyst to ensure the creation of a locally sponsored advisory committee. ADEQ will also assume the role of local sponsor when necessary. However, it will be both difficult and undesirable for ADEQ to be a sponsor in even a minority of watershed management zones. Nevertheless, ADEQ is committed to collaboration and shared responsibility for this important role with other agencies and local organizations.

4.5 ACCOUNTABILITY

ADEQ has identified the basic goals for evaluating the Arizona watershed approach. ADEQ will conduct regular evaluations on the basis of the goals listed in this section to ensure that the framework is held to a high standard of accountability. The feedback from these assessments will provide continued direction for the initiative. Several of the goals listed in this section will have different outcomes or measures as determined by stakeholders in each watershed management zone. Nevertheless, the examples described in this section should be representative of the ones that will likely be developed. The assessment of whether the goals have been achieved or not will, in many cases, remain a subjective judgment. However, identifying and describing areas that have been targeted for improvement will provide a good basis for determining the success of the approach. The ADEQ watershed approach goals are not viewed as empty promises but rather as desired outcomes that ADEQ and the public can evaluate.

Evaluation will be based on reaching goals

4.5.1 Environmental Protection

One of the objectives of the ADEQ watershed approach is to find alternatives to general program measures (i.e., number of permits issued in a fixed period of time) and make greater use of specific environmental objectives that have been tailored to the watershed management zones. Environmental protection will continue to be a statewide goal. Environmental measures of success (i.e., indicators) and assessments will be keyed to individual watershed management zones. The following questions can provide a starting point for developing measures for ADEQ's goal of environmental protection:

- ◆ Have advisory committees developed specific environmental indicators of watershed health for the watershed management zones? ADEQ will provide technical support to the advisory committees for the development of environmental objectives and indicators.
- ◆ Do the selected indicators show progress in maintaining or restoring water quality?
- ◆ Do watershed management zone plans and annual advisory committee updates indicate that environmental objectives are being met within the management zones?

4.5.2 Improve Program Efficiency

Measures to improve program efficiency may take the form of increased numbers of monitoring sites or parameters for the same number of program dollars spent. In addition, it may be possible to estimate the number of modeling studies, hearings, or reports that have been consolidated through coordinated action and reporting. Has the *coordinated* response to complaints improved? Coordinated response is important because many situations require answers or responses from several programs before they can be resolved.

4.5.3 Increase Program Effectiveness

- ◆ Can advisory committees make better use of monitoring data for assessments and the development of management strategies?
- ◆ Is more information available on more waterbodies for conducting assessments of the sources and causes of waterbody impairment? Has the level of uncertainty regarding the status of waters within watershed management zones been reduced? Has assessment information provided an adequate basis for priority setting and targeting waterbodies within watershed management zones?
- ◆ Have advisory committees been able to identify a clear list of management priorities using the information collected and the priority and targeting procedures provided by the watershed approach? Is there a scientific basis for the identified management priorities?
- ◆ Has the watershed approach facilitated the development of TMDLs?
- ◆ Are stakeholders collaborating on a broader range of management solutions than prior to the watershed approach? Are more cost-effective solutions being developed for problems than in the past? Has the watershed approach fostered innovations that would have been unlikely under previous operating procedures?
- ◆ Has stakeholder perception of the permitting process improved? Have consolidated permits effectively reduced the administrative burden associated with the assignment of pollution controls? Have comprehensive assessments and management strategies resulted in permits that have a greater consistency within watersheds. Is the responsibility of controlling pollutant inputs equitably shared by all responsible parties?

4.5.4 Improve Public Participation

Watershed management plans and reports to the advisory committees will include evaluations of citizen and community involvement. The advisory committee reports will evaluate:

- ◆ How many citizens have participated in watershed management zone meetings, volunteer monitoring programs, and mitigation projects?
- ◆ How many communities have adopted the recommendations in the watershed management zone plan?
- ◆ Have communities committed resources to the objectives listed in the goals/stakeholder matrix?

4.5.5 Integrate Management Programs

A useful indicator for the integration of management programs is the number of programs and level of agency participation on the advisory committees for each watershed management zone. Have programs identified the advisory committees as a mechanism to achieve program objectives? Are programs using watershed plans as communication / guidance tools? Are the products of the watershed approach replacing stand-alone program products?

Surveys of stakeholders and program managers should provide an accurate assessment of whether communication and collaboration between management programs have been improved. Identify new areas of coordination between agencies and programs. Is there improved consistency in problems identified and solutions adopted?

4.5.6 Proactive Versus Reactive Management

Is the balance of activities shifting to well-planned prevention and comprehensive solutions and away from site-specific crisis management? Are watershed management zone plans being used as tools for scheduling and providing program guidance and as community implementation plans? Are solutions being identified prior to complaints being filed? Is the balance of work within ADEQ shifting to prevention rather than remediation? Can watershed plans be used as an effective resource to address the concerns of citizens, legislators, industries and other stakeholders?

4.5.7 Improve Data Management

Has agency and stakeholder access/capability to use environmental data improved? What new data use capabilities exist that were not present prior to implementation of the watershed approach? How did the watershed approach contribute to improved data management capabilities?

4.5.8 Improve Working Relationships at All Levels of Government

Is there improved integration in the development and implementation of solutions? Have local governments been effectively included in the watershed approach? Have state and federal agencies increased the level of collaboration in planning and implementation of water quality projects?

4.5.9 Increase Accountability of Agency and Staff Performance

ADEQ will work closely with advisory committees. The advisory committee will have first-hand knowledge of the agency's performance in fulfilling their obligations to the planning and implementation steps for the watershed management zones. The watershed plan will provide a record of decisions, activities, and commitments. Based on this record, ADEQ managers and the public will determine whether ADEQ staff adequately supported the advisory committees and other stakeholders during the planning and implementation steps.

The ADEQ watershed approach also provides both staff and managers with reference points upon which a performance evaluation can be based. Each ADEQ WQD section has identified possible roles and responsibilities that are included in this framework document. These roles and responsibilities will be translated into activities during the watershed management zone planning and implementation steps. Managers will be able to identify performance objectives and outputs within the cycle steps. The following is a preliminary list, by step, of general staff performance criteria:

Step 1: Stakeholder Outreach and Involvement

- ◆ Were all relevant stakeholders contacted?
- ◆ What stakeholders was the staff person responsible for conducting outreach to? Was stakeholder outreach effective?
- ◆ Were presentations to stakeholders of high quality? Were stakeholder goals and objectives adequately described?
- ◆ Were information objectives and needs clearly identified?

Criteria for judging staff performance

Step 2: Collect and Evaluate Watershed Management Zone Data

- ◆ Were information needs associated with all stakeholder goals and objectives addressed? Was all relevant information collected?
- ◆ Did assessments make effective use of existing information?
- ◆ Were assessments completed on time?
- ◆ Were assessments effectively communicated to stakeholders?
- ◆ Were all assessment objectives and requirements addressed? Did the staff person show unusual initiative or innovation in preparing assessment materials?
- ◆ Were all relevant information gaps identified and the implications of missing information explained?

Step 3: List and Target Environmental Concerns

- ◆ Did staff correctly apply criteria on water quality concerns and targeting factors?
- ◆ Did staff work effectively with other stakeholders in assigning water quality concerns to categories and to target project objectives?
- ◆ Did staff help to resolve differences between stakeholders over priority setting and targeting decisions?

Step 4: Develop Management Strategies and Measures of Success

- ◆ Did staff contribute significantly to negotiations to develop integrated management strategies?
- ◆ Did staff contribute to the technical design of a management strategy component? Did staff make a contribution to the management strategy that was particularly innovative or that lead to a significant cost savings?
- ◆ Did decisions by staff lead to an optimal control strategy that effectively balanced control and protection objectives with cost considerations?

Step 5: Compile the Watershed Management Zone Plan

- ◆ Was staff contribution to the watershed report timely and well written?
- ◆ Did staff assist with presentation of the watershed management zone plan to stakeholders?
- ◆ Did staff adequately address issues raised during the review process?

Step 6: Implement and Evaluate the Watershed Management Zone Plan

- ◆ Did staff effectively carry out specific responsibilities identified in the watershed management zone plan?

4.6 ADAPTIVE MANAGEMENT

This section is intended to underline ADEQ's commitment of adaptive management to the development and implementation of the watershed approach. One of the guiding principles of the design phase was to ensure that this approach is as inclusive as possible. ADEQ has communicated with many, but not all, stakeholders throughout the development of this document. This document will remain in draft form and will be subject to revision as changes that will strengthen partnerships with local, state, or federal stakeholders become evident. Even after the document has been reviewed by a broad spectrum of stakeholders, ADEQ will not hesitate to update the description of the watershed approach when experience dictates that a change is necessary. Through the improved stakeholder outreach and involvement elements built into the watershed approach, ADEQ is certain to become aware of improvements that should be made to it. Issues will always remain, and, as they accumulate, they will be summarized in this section to serve as a resource for adapting the watershed approach to the needs of Arizonans.

SECTION 5

THE WATERSHEDS EXPERIENCE JOURNAL

At the time of this writing, ADEQ has initiated the watershed approach in several regions of the state. Section 5 documents what has occurred so far in each of the watersheds to illustrate how the watershed approach can be tailored to meet local circumstances. As the transition to the watershed framework proceeds, the experience in each watershed can guide other watersheds in their efforts, and these descriptions can be updated to serve as a summary of progress.

5.1 SAN CARLOS-SAFFORD-DUNCAN (UPPER GILA WATERSHED)

This watershed is located between Coolidge Dam, which impounds the Gila River to form San Carlos Lake at the downstream end, and the New Mexico state line at the upstream end. It includes the San Carlos River, the San Francisco River and its tributary, the Blue River, and the San Simon River as major tributaries. A large portion of the San Carlos Apache Indian Reservation and the communities of Safford, Duncan, Clifton, and Morenci are located within its boundaries. Ranching, cotton farming, copper mining, and recreation are the major industries supporting the region's economy.

High salinity in the Gila River impacts the downstream San Carlos Lake and the Apache community. A U.S. District Court decision holds upstream farmers responsible for the high salinity, and requires them to adopt practices to reduce the salt, even though agriculture is not the only contributor to the problem. Runoff from state and federal range lands, which contain saline soils and flow from saline artesian springs and wells, contribute to water quality problems. These problems illustrate the interaction between ground water and surface water and the importance of considering both when addressing regional water quality issues.

Initially recruited by ADEQ's Nonpoint Source Pollution Program, the San Carlos-Safford-Duncan Advisory Group has assumed a leadership role in seeking to address water quality concerns associated with the lawsuit, with a major goal of establishing BMPs to reduce salinity and other nonpoint source impacts on the watershed. The Safford District of the Bureau of Land Management is a major sponsor, providing meeting space, financial support, and technical expertise in addressing the salinity issue. The advisory group has also been an effective forum for improving understanding of endangered species issues with the help of the U.S. Fish and Wildlife Service.

The Gila River flows down from its headwaters in New Mexico. Historic overgrazing, natural forest fire suppression, and other factors in New Mexico have resulted in conditions that adversely impact Arizona segments of the Gila River. Recognition of this has led to the formation of a broader partnership between the San Carlos-Safford-Duncan Advisory Group and three similar groups representing upstream segments of the Gila River in New Mexico. Each of these four groups has developed a long-range vision for their respective subwatersheds which looks beyond BMPs toward improving watershed conditions in general, as a way to resolve environmental problems for the long term. Current efforts are working toward unifying their respective plans.

5.2 VERDE RIVER WATERSHED

This watershed extends from the headwaters of the Big Chino Wash, north of Seligman, to the confluence of the Verde River with the Salt River east of Phoenix. Major tributaries include Sycamore Creek (the one near Williams and Flagstaff), Granite Creek, Oak Creek, West Clear Creek, the East Verde River, and the other Sycamore Creek (the one crossing the Beeline Highway on the way to Payson). Much of this watershed is located in higher, cooler elevations, yielding a significant portion of Arizona's surface water flows, including a large portion of the water supply for metropolitan Phoenix. Horseshoe Lake and Bartlett Reservoir, located along the lower reaches of the Verde River, are part its water supply system.

Communities within the Verde River watershed include Chino Valley, Prescott, Clarkdale, Cottonwood, Sedona, Camp Verde, and Payson. Much of the Verde River watershed is national forest. Ranching, irrigated farming, and mining continue to be significant sectors of the economy, along with tourism and recreation. Light manufacturing is an increasingly important factor, as is the housing industry for both retirement and summer residences.

In contrast to the San Carlos-Safford-Duncan (Upper Gila), where ADEQ helped form the local advisory committee, cooperative efforts in the Verde River watershed sought linkage with several existing groups, some of which predate the initiation of watershed efforts by ADEQ's Nonpoint Source program. In the Verde, the Bureau of Reclamation supports a locally-grown Internet home page, the VerdeNet. ADEQ involvement includes collaboration on both the larger watershed issues, such as TMDL allocation for water quality-impaired streams and characterization of the region, and site-specific issues, such as wastewater management for communities along Oak Creek.

5.3 SAN PEDRO-WILLCOX PLAYA-RIO YAQUI WATERSHED

This watershed management zone combines three distinct watersheds: the San Pedro River itself, the Willcox Playa (dry lakebed), and several south-flowing tributaries to the Rio Yaqui in Mexico. The San Pedro River is the state's largest undammed river and contains some of the last areas of perennial stream flow in Arizona. Its headwaters are located in Sonora, Mexico, near the copper mining town of Cananea. From there, it flows north across the border near Palominas through the San Pedro Riparian National Conservation Area, ultimately joining the Gila River at Winkelman. Major tributaries include the Greenbrush Draw, the Babocomari River, and Arivaipa Creek. Numerous washes and canyons emanating from the several mountain ranges that parallel the valley drain to the San Pedro along its course.

Communities within the closed basin of the Willcox Playa include Willcox and Kansas Settlement. The border communities of Douglas and Aqua Prieta (Sonora) are located along Whitewater Draw which drains south to the Rio Yaqui in Mexico. Part of the historic mining community of Bisbee drains via Mule Gulch to the Whitewater Draw and part drains to the Greenbrush Draw and ultimately the San Pedro. Bisbee and the sister communities of Naco Arizona-Sonora share a common ground water basin, one of only two in the state to be declared a sole-source aquifer for water supply purposes.

Communities within the San Pedro River watershed include Sierra Vista, St. David, Benson, San Manuel, and Mammoth. Several small communities dot the course of the San Pedro, some of which are more than twenty miles from the nearest paved road.

The economy of the region varies from ranching and irrigated farming to mining, tourism, the Fort Huachuca Military Reservation, and light manufacturing. The San Pedro National Riparian Conservation Area attracts bird watchers from around the world.

In the Sierra Vista segment of the San Pedro River, water quantity concerns drive cooperation among the University of Arizona, the U.S. Geological Survey, the Bureau of Land Management, the Department of Defense, the Agricultural Research Service, the Arizona Department of Water Resources, Arizona Game and Fish, the City of Sierra Vista, and Cochise County.

Coordination on a variety of projects to better understand the relationship between the ground water aquifer and the river, waste water management, water supply, and consumption is accomplished through a technical review committee. At present, this group is chaired by a representative of Cochise County. Formed well ahead of the proposed schedule for ADEQ to initiate watershed-based efforts in the San Pedro watershed, this group functions in much the same way as the watershed advisory groups envisioned in the watershed framework. As such, it is a good candidate to act as a forum for broader efforts within the watershed as ADEQ implements the watershed framework in this watershed. In this case, it may make sense for ADEQ involvement to be limited, in line with locally-identified needs.

In another part of the San Pedro watershed, ADEQ is in the early stages of helping a group of local citizens and government form itself into an advisory group to deal with ground water quality issues in an area dependent on it for its drinking water. The scope of interest of the Bisbee-Naco Water Group is an example of a nested subwatershed within a larger watershed.

Over broader areas of the region, Resource Conservation Districts are implementing portions of the 1996 Farm Bill, which require community-based planning and prioritization of environmental concerns and benefits to guide funding through various agriculture assistance programs. The Willcox-San Simon, Whitewater Draw, Hereford, San Pedro, Redington, Winkelman, and Gila Valley NRCs can have leading roles within the region. Linking of the various groups could take the form of simply maintaining awareness of each other's activities in the context of the larger watershed or it could be more formal. It depends on what makes sense in terms of how closely subwatersheds impact each other and what suits the parties involved.

5.4 SANTA CRUZ-RIO DE MEXICO WATERSHED

This region combines the Santa Cruz River and its tributaries with several south-flowing drainages that flow into Mexico. The Santa Cruz originates in the Patagonia Mountains within Arizona. It flows south into Mexico before crossing back into the United States near Nogales. From there it flows north through Tucson before joining the Gila River near the Gila River Indian Reservation community of St. John's Mission. Major tributaries include the Nogales Wash, Sonoita Creek, Cienega Creek-Pantano Wash-Rillito Creek subwatershed, Brawley Wash, Santa Rosa Wash, and Vekol Wash.

The Rios de Mexico subregion includes several major washes which originate on the Tohono O'Odham Indian Reservation and drain into Mexico. Notable among these are the San Simon Wash and its tributary, the Vamori Wash.

Communities within the Santa Cruz-Rios de Mexico region include the sister cities of Nogales, Arizona-Sonora, Green Valley, Tucson, and Maricopa. Major portions of the Santa Cruz-Rio de Mexico combined watershed are occupied by the Tohono O'Odham (aka Papago)) including the noncontiguous San Xavier District near Tucson) Pascua Yaqui, Ak Chin, and Gila River Indian Reservations.

Industries include ranching, cotton, citrus, and other irrigated farming, mining, and manufacturing in both Maquilladora plants along the border and aerospace/electronics in the Tucson area. The Santa Cruz Valley is also a major transportation corridor for items crossing the Mexico border and east-west transportation across Arizona. Trade in agricultural commodities to and from Mexico is a major economic factor for the entire region.

ADEQ is preparing to initiate watershed-based activities in the Santa Cruz. This will build on the experience with similar efforts in the Tucson area related to the Comprehensive State Ground Water Protection Program. Tucson, the only other designated sole-source aquifer besides Bisbee-Naco, faces a number of environmental concerns, including use of Central Arizona Project water imported from the Colorado River to stem depletion of its aquifer and ground water contamination from historical industrial practices related to aerospace and other industries located there. The Bureau of Reclamation is currently leading efforts to plan for reuse of municipal wastewater.

Nogales suffers from surface and ground water contamination from municipal and industrial sources. Nogales has initiated a wellhead protection program to deal with some of its concerns, and this program may serve as a useful springboard for broader protection of its water supplies within a watershed framework.

Other communities, such as Rio Rico, are seeing development of housing tracts that were subdivided years ago. As is common in such cases, the reliance on individual septic tanks for domestic wastewater may threaten ground water with nitrate contamination, particularly in areas where soil conditions may not be suitable for septic systems.

5.5 COLORADO RIVER-LOWER GILA RIVER

This watershed combines the Colorado River from Hoover Dam to the Mexico border with the Gila River between the Painted Rocks Reservoir to the confluence with the Colorado. This segment of the Colorado is the most regulated and utilized river in the West. Davis Dam, Parker Dam, Imperial Dam, and Morelos Dam regulate flow and store water for southern California, southern Nevada, central Arizona, Baja California and Sonora, Mexico. Major aqueducts, including the Colorado River Aqueduct, which supplies the Los Angeles and San Diego areas of California with drinking water, and the Hayden-Rhodes Aqueduct (Central Arizona Project), which serves metropolitan Phoenix and Tucson and thousands of acres of irrigated cropland in Arizona, draw water from Lake Havasu upstream of Parker Dam. The Imperial and All-American canals bring irrigation water to the Imperial Valley of California. The Fort Mojave, Chemhuevi, Colorado River, Fort Yuma, and Cocopah Indian Reservations lie along the Colorado River and utilize water for both domestic and irrigation purposes. Both the Colorado River and the Lower Gila River provide irrigation water for a variety of crops along the Gila River and around Yuma.

Communities within the Colorado River portion of this watershed include Kingman, Bullhead City, Lake Havasu City, Parker, and Yuma. Along the Lower Gila River portion, there are the primarily agricultural communities of Agua Caliente, Roll, Tacna, Mohawk, Wellton, and Dome. Large portions of the area are occupied by military facilities, including the U.S. Army Yuma Proving Ground and the Barry Goldwater Air Force Range. The Kofa and Cabeza Prieta National Wildlife Refuges are also located within the region's boundaries.

Recreation and wildlife also compete for the resources of the Colorado River. The Lake Mead National Recreation Area and the Havasu and Imperial National Wildlife Refuges are located along this segment of the Colorado. Several state parks and privately operated recreation facilities, along with vacation homes and resort areas add to the demands, both on water supply and the environment, especially factors such as nutrient loading from domestic wastewater and urban and agricultural runoff. Winter visitors attracted to the warm climate swell recreational vehicle parks in several communities along the Colorado. Ironically for a desert, flooding is a recurring threat to croplands and communities along both the Colorado and Gila Rivers.

Although implementation of the ADEQ watershed framework in the Colorado River-Lower Gila River watershed is not scheduled to begin until 1998, a number of ADEQ activities are ongoing. These include regulating drinking water safety for small water systems associated with the winter RV business and vacation communities; wastewater management for the several communities along the river; and nitrate contamination of ground water resulting from inadequate or failing septic systems.

La Paz County has taken over the task of maintaining an areawide waste management plan (per Section 208 of the Clean Water Act) for its area. Mojave County and Yuma County are considering doing the same. ADEQ is working with these jurisdictions to help them assume these duties. Other outreach efforts by ADEQ include introducing concepts of wellhead protection and the watershed framework at community workshops, along with soliciting candidate wastewater treatment and nonpoint source pollution projects for State Revolving Fund financing and giving advance notice of the new Safe Drinking Water Revolving Fund to finance water system improvements.

5.6 COLORADO RIVER-GRAND CANYON

This watershed includes the segment of the Colorado River between Hoover Dam and the Utah state line above Glen Canyon Dam. Included also is the short segment of the Virgin River crossing the extreme northwest corner of Arizona as it flows from Utah to Nevada where it empties into Lake Mead. The Grand Canyon is the most striking feature of this watershed. Besides being the premier sightseeing attraction in the United States, it isolates the Arizona Strip and its few small communities from the rest of the state.

Communities within the Colorado River-Grand Canyon region include Colorado City, Fredonia, and Jacob Lake on the Arizona Strip, and Grand Canyon Village (South Rim) and Williams. The Grand Canyon National Park, the Lake Mead and Glen Canyon National Recreation Areas, and the Kaibab National Forest occupy large areas of the watershed, along with the Hualapai, Havasupi, and Kaibab Indian Reservations.

Implementation of the watershed framework in the Colorado River-Grand Canyon area is scheduled for 1998. ADEQ's recent efforts in the area include assisting the towns of Fredonia and Colorado City in permitting the closure of their old landfills and replacing them with a jointly operated landfill, and beginning a dialogue on wastewater treatment, water supply, and impacts of neighboring Kanab, Utah on south-flowing Kanab Creek. The separation of this area by the Grand Canyon into two main subregions may point towards ADEQ watershed implementation in a like manner, if only for logistical purposes in meeting with communities on either side of the Grand Canyon. Utah's adoption of a watershed approach provides an opportunity for cooperation across the state line.

5.7 BILL WILLIAMS RIVER

This watershed includes the Bill Williams River and its tributaries, the Big Sandy River, Santa Maria River and Date Creek. The mouth of the Bill Williams River empties into Lake Havasu, just above the intakes for the Colorado River and Hayden-Rhodes Aqueducts. Alamo Lake, located about 25 miles upstream of Lake Havasu, is formed by a U.S. Army Corps of Engineers dam built to reduce flood flows along the Bill Williams and subsequent high sediment loading near the California and Arizona water intakes.

The watershed is sparsely populated, with the copper mining town of Bagdad as the largest community. Implementation of the watershed framework is scheduled for 1998.

5.8 MIDDLE GILA RIVER

This watershed includes the Gila River from the Coolidge Dam to the Painted Rocks Reservoir and the portion of the Salt River from the Granite Reef Diversion Dam to its confluence with the Gila near Avondale. Major tributaries include the Agua Fria and Hassayampa Rivers and the Centennial Wash.

This region is complex and diverse, containing everything from historic and active mining in the Superior, Kearny, and Hayden areas to large-scale irrigated agriculture. Manufacturing and commerce support the majority of the state's population within metropolitan Phoenix, located in the heart of the watershed.

The complexity of this watershed and its issues led to the decision to delay implementation of the watershed approach in this area until 1999. Synchronization of NPDES permits within this watershed is beginning in 1997. This action by EPA, along with issues related to Phoenix's 91st Avenue Wastewater Treatment Plant, wastewater reuse, constructed wetlands, and flooding problems, requires ADEQ to provide a limited amount of support for these activities in advance of its scheduled transition to a watershed approach. The challenge is to maintain an appropriate level of support and cooperation with various partners working in the area, while not overextending ADEQ's staff and budget resources to the detriment of the overall watershed implementation. Managed successfully, this support will facilitate a smooth transition to the watershed framework.

5.9 SALT RIVER

This watershed includes the Salt River and its tributaries above the confluence with the Verde River. It extends from the heights of the White Mountains to the Granite Reef Diversion Dam and includes the Black River, White River, Cherry Creek, Tonto Creek, and Pinto Creek as major tributaries. Along with the Verde River, the Salt River is a major source of water for the Phoenix metropolitan area. Roosevelt Lake, Apache Lake, Canyon Lake, and Saguaro Lake are all part of the system for regulation and storage of surface water for this purpose. Nearly all of the watershed is occupied by national forest and the Fort Apache and San Carlos Indian Reservations.

The importance of the Salt River, both for the communities within the watershed and the downstream municipal users of water from the Salt River, will require cooperation among an assortment of stakeholders. Implementation of the watershed approach is scheduled for the year 2000.

5.10 LITTLE COLORADO RIVER-SAN JUAN RIVER

This watershed management zone combines the Little Colorado River above its confluence with the Colorado River within the Grand Canyon National Park and the various tributaries to the San Juan River, which does not cross into Arizona on its way to Lake Powell in Utah. Most of this watershed area is occupied by the Navajo and Hopi Indian Reservations. The communities of Flagstaff, Winslow, Holbrook, Snowflake, St. Johns, Springerville, and Eagar are included in the Little Colorado River watershed.

Implementation of the watershed approach is scheduled for the year 2000. In the meantime, ADEQ is cooperating with the Bureau of Reclamation, the Arizona Department of Water Resources, and others to assist the town of Eagar in addressing water quantity and quality issues impacting their community.